Gas Journal

VOL. 280 106TH YEAR LONDON DECEMBER 22 1954 No 4777 PRICE 1/3

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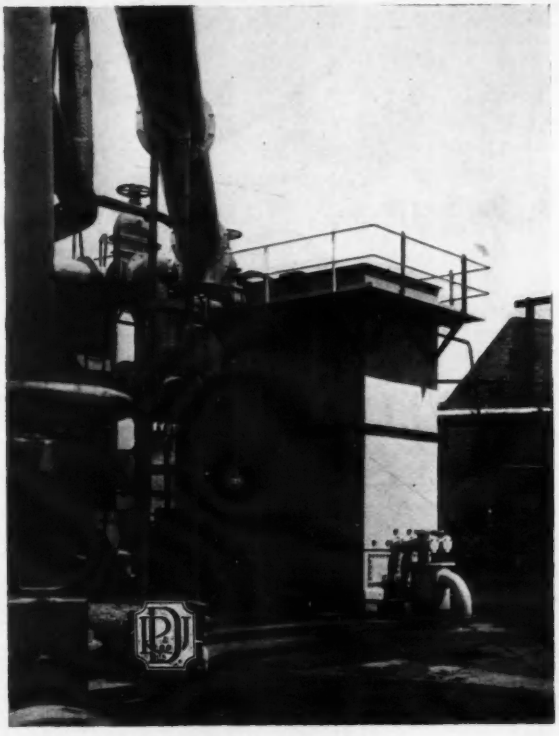

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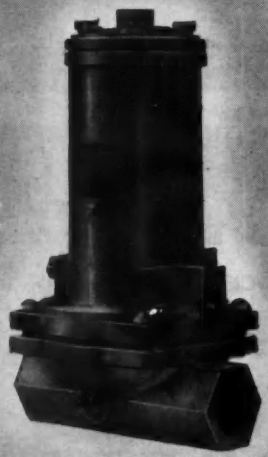

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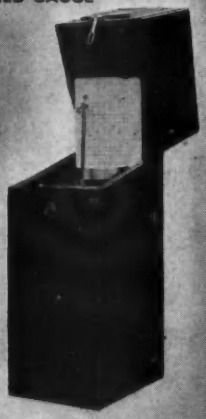

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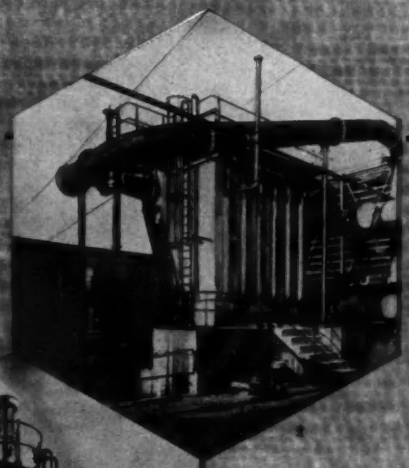

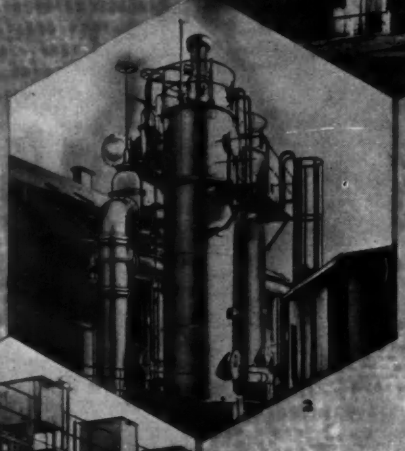

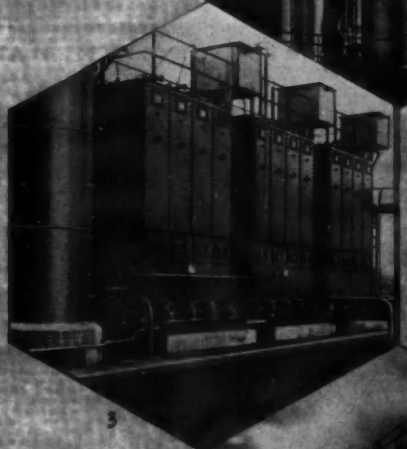

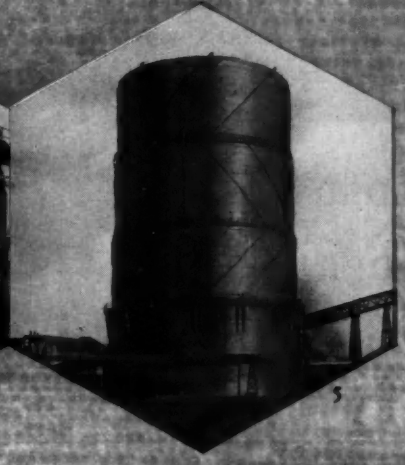

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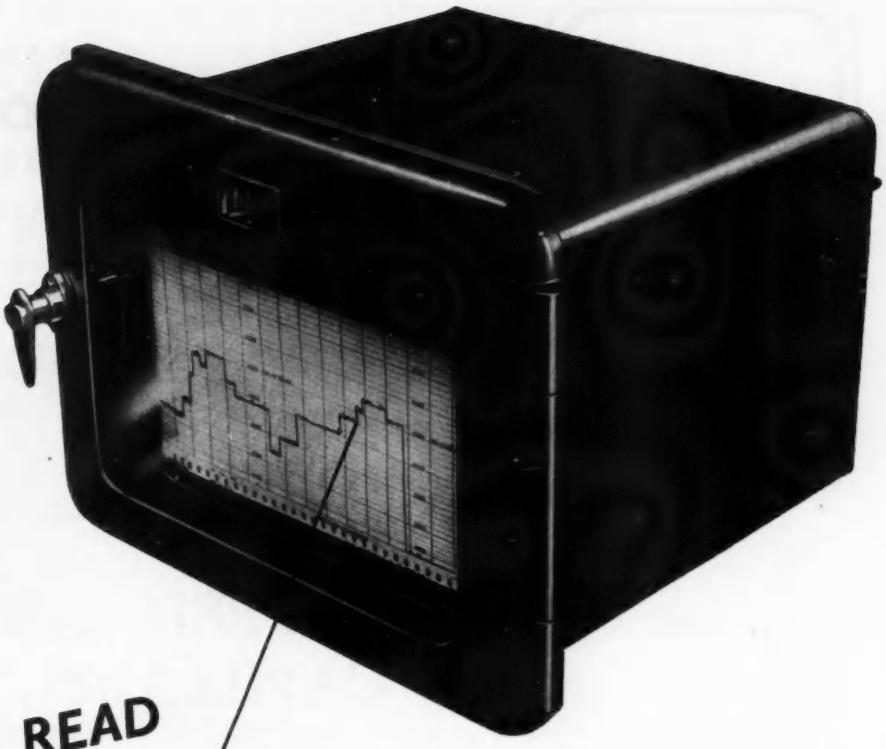

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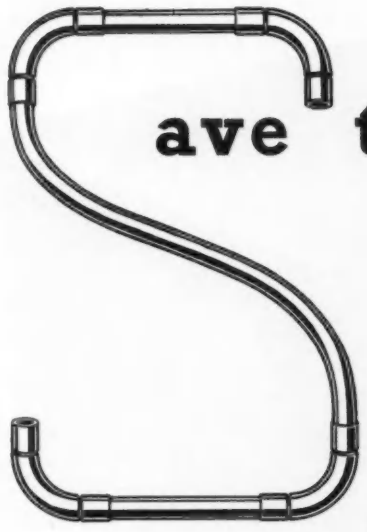

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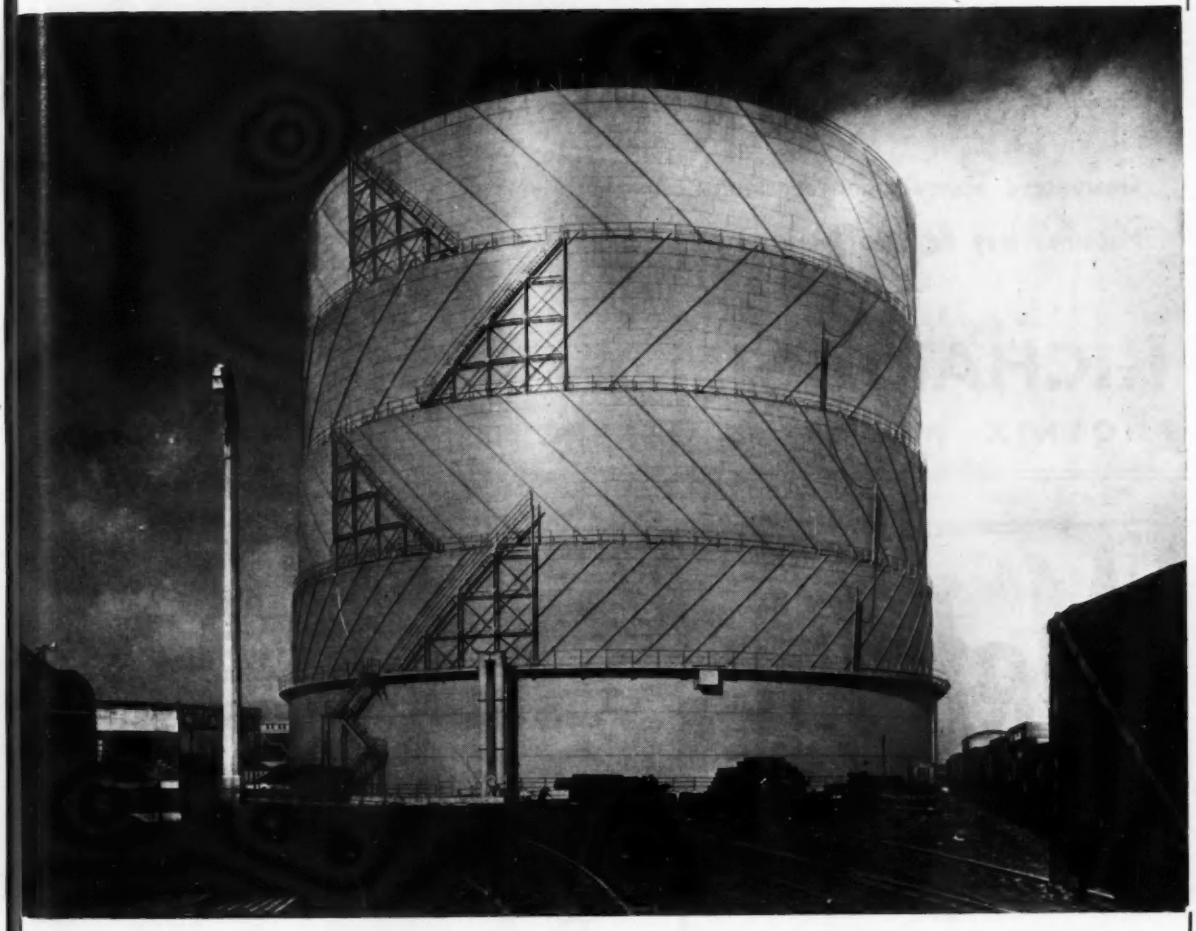

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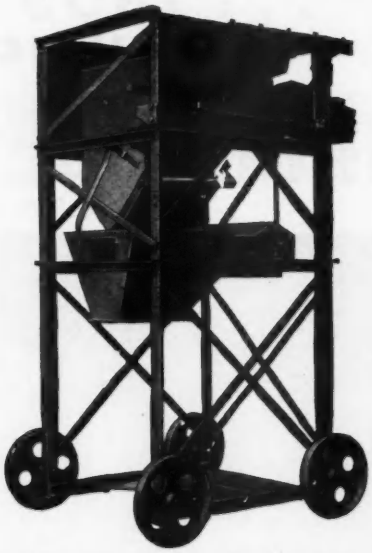

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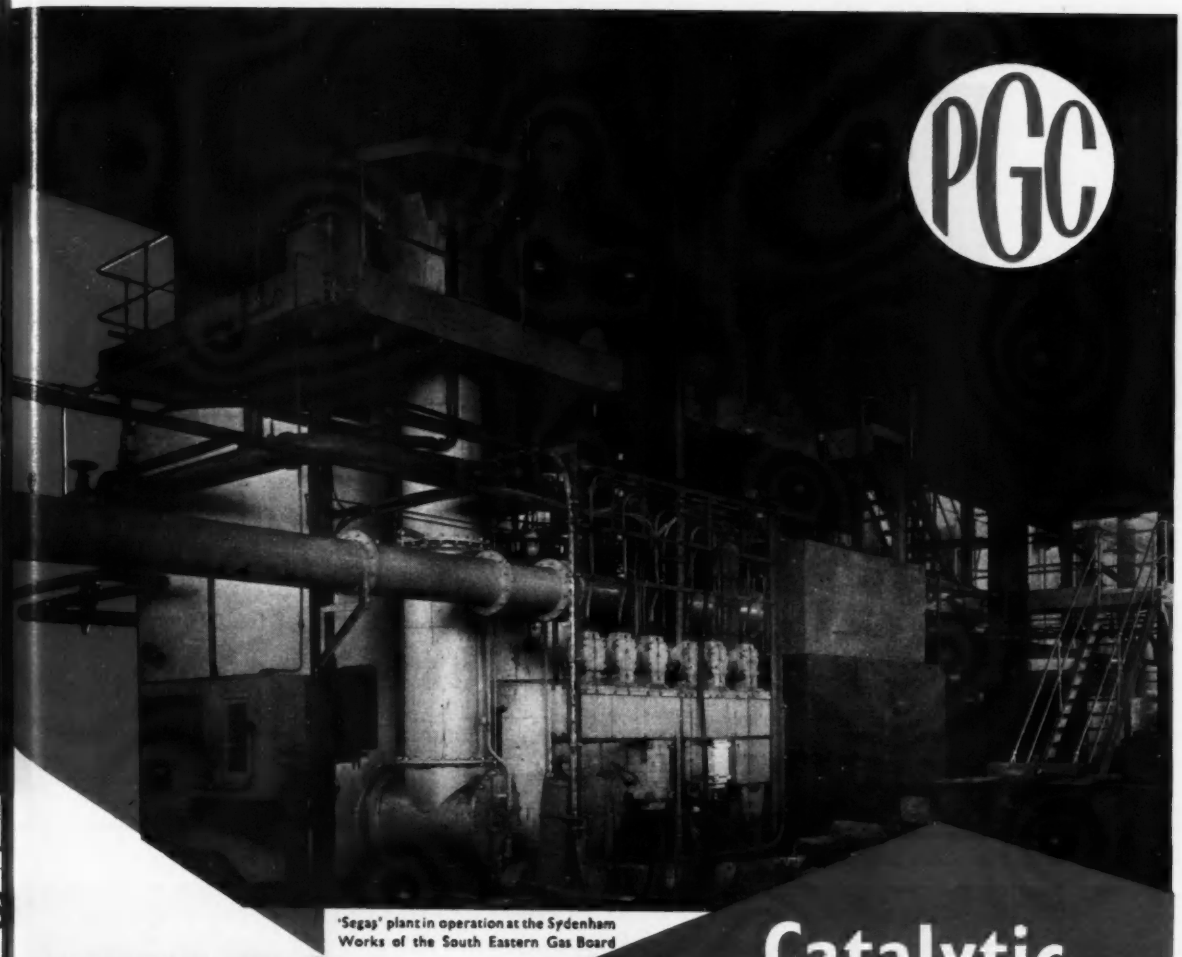

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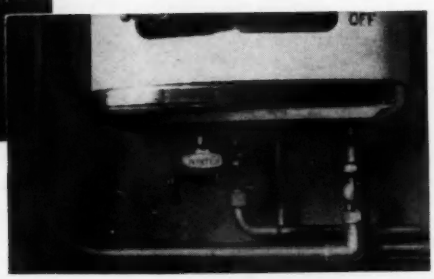

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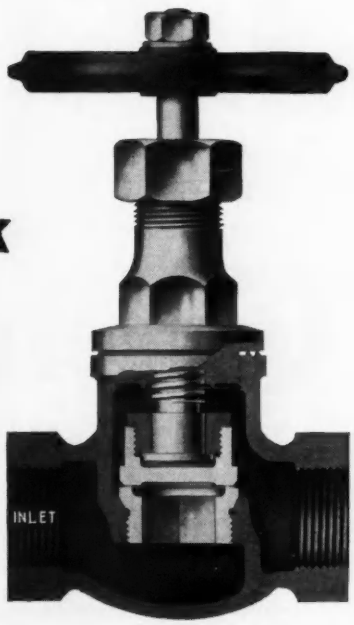

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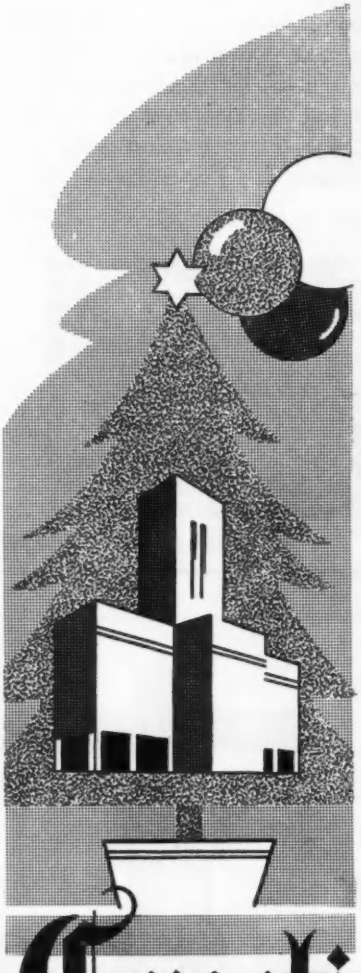

★ Bench showing Waste Gas Offtakes and Main Flue, and Isolation Dampers for Chimney and Waste Heat Boiler.

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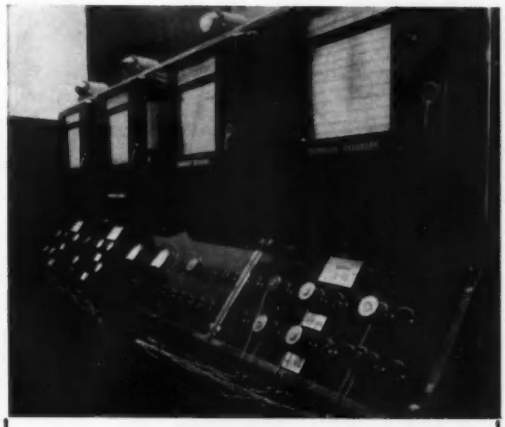

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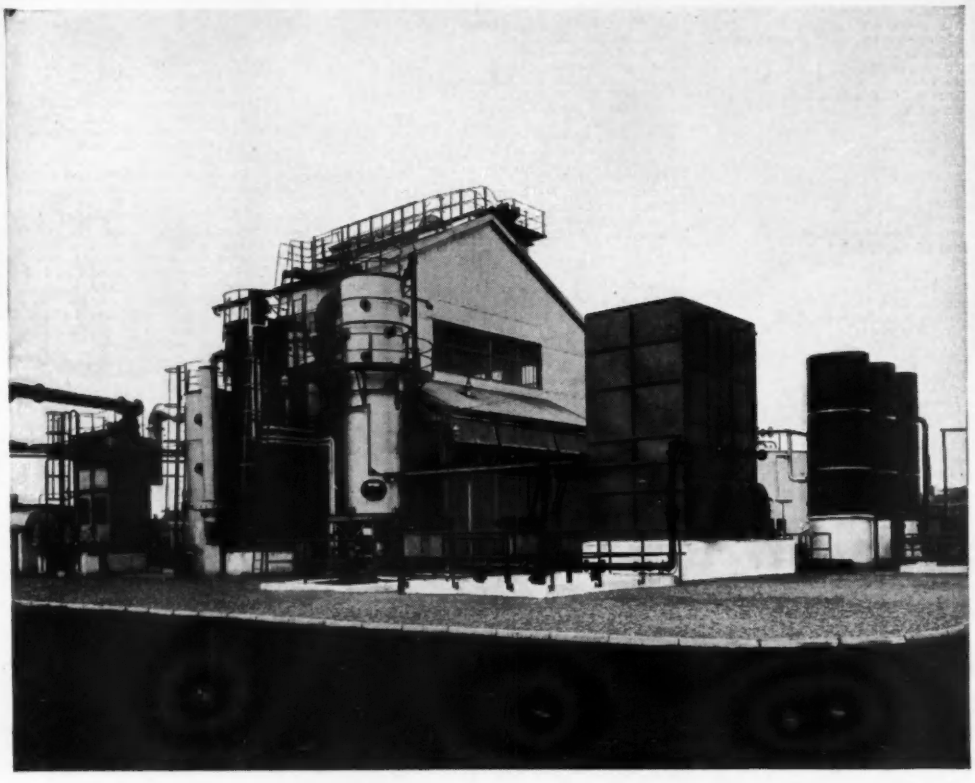

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Gas Journal

VOL. 280 NO. 4777 DECEMBER 22, 1954

106TH YEAR

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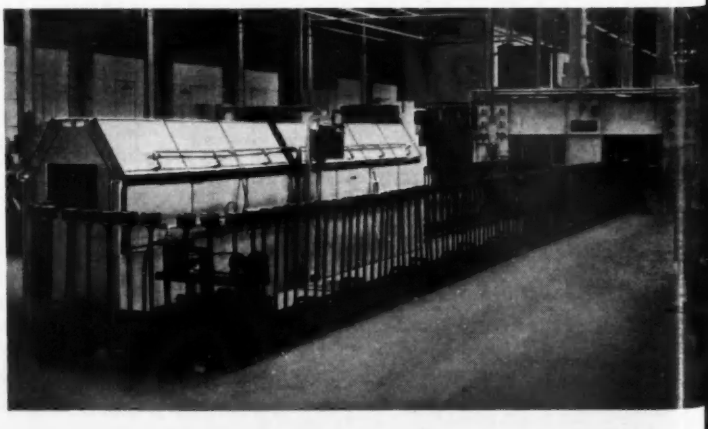

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Gas Journal

VOLUME 280 . No. 4777. DECEMBER 22, 1954. 106th YEAR

A Very Happy Christmas to All Our Readers

Mr. Nabarro's Bill

LIFE is full of surprises! It was only a month ago that the Report of Sir Hugh Beaver's Committee on Air Pollution was published and already a Clean Air Bill designed to implement certain of the recommendations of the Report has been presented to Parliament. By a chain of fortunate circumstances the cumbersome machinery of legislation has been persuaded into such a state of violent acceleration in this matter that it leaves the onlooker quite breathless. The near-miraculous means by which this state of affairs has been brought about is personified in Mr. Gerald Nabarro, Conservative M.P. for Kidderminster, who, by a stroke of luck, recently drew first place in the ballot for Private Members' Bills in the House of Commons.

As is well known, Mr. Nabarro is keenly interested in all matters appertaining to fuel, especially its more efficient utilization, and it is common knowledge that his voice is usually to be heard in the House whenever the supply, distribution or use of fuels are being discussed. When one considers the multitude of subjects that clamour for consideration in Bills to Parliament we can conclude that it is indeed fortunate for the nation that the Member for Kidderminster has this lively interest in the abolition of atmospheric pollution and that he used his precious opportunity of presenting a Private Member's Bill to further the cause of clean air.

According to *Hansard* of December 15, this Bill is 'to confer powers on local authorities to establish smokeless zones and smoke control areas, and to require use of approved types of industrial furnaces and ancillary plant and domestic heating appliances; and generally for securing in all connections the abatement of atmospheric pollution and smoke.' Supporting Mr. Nabarro's Bill were Mr. Robens, Colonel Lancaster, Mr. Noel-Baker, Mr. Maude, Mr. Marquand, Mr. Powell, Mr. Greenwood, Sir W. Darling, Dr. King, Sir J. Barlow and Mr. L. M. Lever, and the Bill is due to be read a second time on February 4 next.

Now although Mr. Nabarro is a keen supporter of fuel efficiency and the abolition of atmospheric pollution, he is also a realist and an astute politician. This can be deduced from the fact that his Bill makes no effort to cover all the comprehensive and varied recommendations of the Beaver Report. In view of the many controversial issues involved in the Report, it is almost certain that, had he attempted to incorporate all its proposals, his 'infant' Bill would have been blighted in early youth, if it was not still-born! The Minister of Housing has already indicated that he does not consider Private Members' legislation suitable for introducing measures involving large public expenditure, and it is not surprising, therefore, to find that Mr. Nabarro's Bill omits four of the twelve main recommendations of the Beaver Committee which involve Exchequer assistance. Nevertheless, it does seek to enact the general prohibition proposed on dark smoke and does endeavour to get things moving by encouraging the extension of 'smokeless' and 'smoke control' zones. It also envisages other measures which include:—

1. Obligatory use of efficient grit and dust arresting plant in new industrial installations;
2. Extension of the Alkali Acts to give inspectors responsibility for ensuring the best means of preventing dark smoke, grit or harmful gases in processes where this is especially difficult;
3. General provisions regulating the design of new industrial furnaces;
4. Responsibility to be placed on local authorities for enforcing the law for the prevention of smoke and grit;
5. Annual reports to be submitted by local authorities on their progress in smoke abatement;
6. Increased penalties for smoke offences.

It has been suggested in certain quarters that as the Government's intended Bill to implement some of the Beaver Committee's recommendations may take some time to draft, it is possible that the Government will

adopt Mr. Nabarro's Bill, if it makes progress, and then introduce amendments at the Committee stage. One can see the Government's point of view in this matter. It does not like being rushed in such an abrupt fashion into legislation which may involve fundamental changes in so many industries, quite apart from large expenditure of public money. On the other hand, in this case, it may be prepared to allow the Bill to take its course and to see how it fares in its passage through further readings, always bearing in mind that amendments can be introduced at a later stage if the Bill appears too sweeping in its final form.

One thing is certain—the Beaver Report is destined to differ from all other previous Reports dealing with fuel efficiency and allied subjects in that it is going to be acted upon with what may justly be called remarkable celerity. Whether Mr. Nabarro's Bill will ever pass into law is a matter for conjecture. It may be so watered down before acceptance that even Mr. Nabarro will not recognise it; it may be thrown out altogether. No matter—the abolition of air pollution has got to come, be it late or soon, and Mr. Nabarro's Bill will keep the problem before the minds and attention of the nation in the months ahead as no other means could do. Who knows, it may well prove to be a milestone, perhaps a landmark, on the road that leads to cleaner air. We hope that Mr. Nabarro will have as good fortune with the passage of his Bill as he had in the draw.

Accent on the Strip

IT is a fairly common experience among public relations officers that people are more and more ready to read less and less when the subject is serious, unless they have a professional and really personal interest in the subject matter. That is why the majority of the area boards have made a habit, after the formal publication of their annual reports and accounts, of presenting to their own workpeople and indeed the members of their staffs as well as their consumers, the highlights of their achievements in various popular forms, ranging from a miniature magazine in colour to a modern 'sensational' news sheet and a strip cartoon. Figures—bare and nearly bare—have been employed in more than one instance to attract popular attention to the sober facts of gas finance, and matters which might well have been overlooked in the cold print of the official report have become glamorised as vital things in the industry's affairs. To Mr. Walker Smyllie, of the North Western Gas Board, we must give credit for the latest new line of approach—a brilliantly conceived and cleverly drawn strip cartoon headed 'Across the Hurdles at Mr. N. W. Therm's point-to-point,' telling the story in terms of a National Gas Steeplechase. No greater testimony to the popularity of its appeal could be found than the extent of the comment it aroused in the national dailies, running to an average of over half a column in five of them and an entire 'City Man's Diary' one day in the *Evening Standard*.

Last year Miss Bikini was the heroine of the Board's yearly story. This year Lady Godiva is the central figure of 'some televiewed glimpses of the performance of the North Western Gas Board in its fifth year of running.' In all there are 26 cartoons. A picture of Lady Godiva approaching the winning post carries the caption: 'The bare figures tell a clear story of success. To achieve them we all had to take our jackets off. But Lady Godiva says this is not enough for the North West, and spurs us on to still further effort.' The story opens with an immaculate Douglas P. Welman announcing that the N.W.G.B. stable did well in the fifth year's National Gas Steeplechase, and closes with one of the sideshows of the racecourse, a fortune teller's booth. 'To forecast the future is always difficult,' we are told, 'but teething troubles now seem to be safely surmounted. The Board's report says that the development work undertaken during the first four years has now begun to show effect and that economics through higher efficiency will continue to accrue. Gas prices will not increase in the immediate foreseeable future.' Even the Rochdale process is given a popular turn in one of the cartoons, and soaring coke sales are represented by a toy-balloon vendor who explains that the 1,617,000 tons sold during the past year, against 1,494,000 tons in the previous year, was a seventh of the total national sales of coke.

BRIDE OF THE YEAR

Half a million brides of Britain will be invited to compete in cookery, laundry, and other aspects of home management in a nation-wide contest next year for valuable prizes. The tests include written questionnaires, personal interviews, individual performances, and public demonstrations. The competition, which is being promoted by the Gas Council, whose previous contests such as 'Festival Fare' and 'Youth in the Kitchen' have been so successful, is novel in form and much enlarged in scope, and by the time the entrants have passed through their area and final competitions they will have undergone tests in meal preparation, general cookery and housewifery, including home laundry and the correct method of using a refrigerator, a not-fully understood addition to the modern home.

The competition will be open to all women who have been married between January 1, 1954 and April 30, 1955, with the exception of employees and wives of employees in the gas industry. In 1952 there were 349,308 marriages. The final contest, under the title of 'Mr. Therm's Bride of the Year', will be held at the Royal Festival Hall, London, on Tuesday, November 1, 1955, when the 12 finalists will compete for the title. Entry forms will be available in March through coupons in newspaper advertisements or from gas showrooms throughout the country.

The competition will be run in four stages, the first three of which will be conducted under the auspices of the 12 area boards. The first round consists of written questionnaires showing knowledge in cookery and laundry. The second includes a personal interview and the baking of a cake at home from a set recipe. The third round will constitute the area finals from which winners will proceed to the national final competition in London.

Details of the final housewifery test which will be in public will be announced later. The winner of this will receive a prize value £500 and the runners up £250 and £150 respectively, with eight consolation prizes of £50 each. The winners of the leading prizes will be entitled to regard themselves as accomplished housewives. Theoretical and practical demonstrations of their knowledge and efficiency under expert judging will have proved them to belong to the foremost ranks among women who are proud of their homes.

Mobile Gas for Scottish Islands

Plans have been completed to extend the scope of bottled gas to several more of the north islands of Scotland following on the success of the system in feeding Westray and Sanday. The islands of Housay, Egilshay, Stronsay, Eday, North Ronaldshay, Papa Westray and Hoy are to be given a comparable service. This follows on an agreement between Calor Gas (Scotland) Ltd., the shipping concerns, and the North of Scotland Hydro Electric Board, to provide supplies at a price comparable with that operating in the mainland area—the added cost of transport being absorbed by the various interests concerned to provide a suitable service for the islanders pending the development of electrical services.

London Juniors See Films

Two of the Babcock & Wilcox library films were shown to the London and Southern Junior Gas Association on December 15 in London.

After the party had had cocktails with representatives of the firm—and, incidentally, of the National Coal Board—there was a viewing of *Craftsmen Welders*. This deals largely with the steps taken by Babcock & Wilcox to ensure that a balanced force of craftsmen is always available. This film is of great importance to those interested in either welding or the training of personnel in specialised tasks. It is available on loan, free of charge, in either 16 mm. or 35 mm.

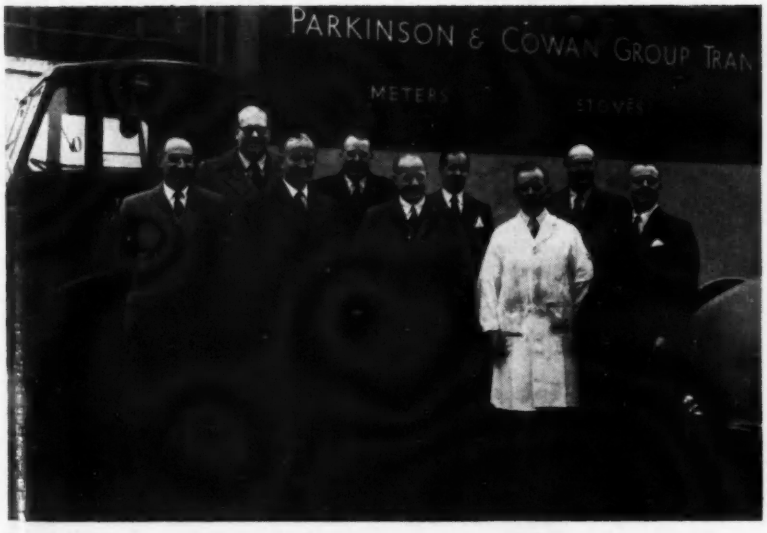
Another film shown was *Steam for Power*, which was of general interest. This is not available as the firm has only its own copy.

After Mr. R. F. Archer had answered questions about the films put to him by the London Juniors, Mr. E. W. B. Dunning, President of the Association, thanked Babcock & Wilcox, Ltd., for an an interesting evening and for their hospitality.

GAS AT SMITHFIELD SHOW

The uses of coke on the farm were illustrated on the Gas Council's stand at the Smithfield Show, Earls Court, by these models of plant for grass drying, dairy sterilizing, and grain drying. The direct application of ammoniacal liquor to the land as a valuable fertilizer was also illustrated and a map showed the centres where advice on this subject can be obtained.

NEW METER SHOP IN SOUTH WALES



On December 7 a newly-equipped meter assembly and repair shop of Parkinson and Cowan, Ltd., was formally opened at Cardiff by Mr. T. Mervyn Jones, the Chairman of the Wales Gas Board. Accompanied by Mr. W. T. Hird, Distribution Engineer, Mr. C. B. Mawer, Secretary, and Mr. Gordon Davies, the Chairman's personal assistant, Mr. Mervyn Jones made a close inspection of and showed keen interest in the many novel features incorporated in this up-to-date plant. With the aid of the Company's transport fleet, this factory is designed to provide a highly efficient new and repair meter service to every undertaking in Wales.

Diary

Dec. 30.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, London, W.C.2.

Jan. 4.—MIDLAND JUNIORS: 'Some Functions of a Coal Test Works,' G. E. Brooke. Birmingham.

Jan. 4.—EAST MIDLANDS G.C.C.: Victoria Station Hotel, Nottingham. 11.30 a.m.

Jan. 7.—LONDON JUNIORS: 'International Gasworks Practice,' J. D. Grant. 178, Edgware Road, London, W.2, 6.30 p.m.

Jan. 7.—WALES G.C.C.: Shire Hall, Shrewsbury, 2.30 p.m.

Jan. 8.—SCOTTISH JUNIORS (EASTERN): Short Paper Day. Dundee.

Jan. 12.—MANCHESTER JUNIORS: Short paper for 'F. Johnston' prize. Manchester Demonstration Theatre.

Jan. 14.—SCOTTISH JUNIORS (Western District): 'Letting Steam Off,' J. R. MacOwen. 522, Sauchiehall Street, Glasgow, C.2. 6 p.m.

Jan. 15.—YORKSHIRE JUNIORS: 'Coke—The Smokeless Fuel,' W. I. Ineson. Harrogate.

Jan. 17.—WEST MIDLANDS G.C.C.: Committee Room, Gas Offices, Edmund Street, Birmingham 3. 2.30 p.m.

Jan. 20.—MIDLAND JUNIORS: Visit to The Jeavons Engineering Co., Ltd., Tipton.

Jan. 22.—LONDON JUNIORS: Visit to a coal mine.

Jan. 22.—WESTERN JUNIORS: Visit to Basin Works. 'Industrial Development in the Rural Areas,' E. I. Luscombe. Exeter.

APPLYING WORK STUDY TO THE GAS INDUSTRY

Eastern Board's Expert talks to the London and Southern Section

Mr. J. B. Maylam, Work Study Engineer to the Tottenham Division of the Eastern Gas Board, told the London and Southern Section of the Institution of Gas Engineers on December 14 how work study could be practised applied to the gas industry. After reading the first part of his paper outlining a general survey of work study, he went on to describe its application to meter reading in his division.

In work study, said Mr. Maylam, the operative words were *systematic* and *improvement*. But he gave a warning that 'this kind of activity can cause considerable apprehension and bitter resentment among both supervisors and operatives.' It was this possibility which frequently persuaded management against the use of work study. Experience had shown, however, that provided industrial relations were good, work study could be practised harmoniously. He went on to assert that: 'It is essential that management shall convince employees that the application of work study is a team effort and a matter in which the intelligent co-operation of all will be enlisted to achieve a result in which all will benefit. The selling of this idea will take time and patience.'

Trade Union Attitude

Turning to the attitude of trade unions towards the subject, Mr. Maylam said it had changed from when in the past the stop-watch was used as a vicious excuse for rate cutting and little regard to job improvement and the essential requirements of the worker. The trade union attitude would vary with each industry, but the majority would co-operate in promoting work study, provided management was prepared to give guarantees:

(a) That redundancy would be the subject of consultation, and that management would deal with it in a spirit of generosity, and that their members would not be dismissed from employment;

(b) That whenever practicable members would share in whatever economies were obtained in the form of an increase in the pay packet; and

(c) That management would be prepared to consult and negotiate on all points affecting their members.

Mr. Maylam went on to describe how work study was applied. There were certain stages common to each study. They included the selection of the job, recording the facts and developing the improved method. Work measurement, he said, would indicate the number of men required to do a certain job of work. It would provide a basis for better planning of work, so that men and machines were better utilized. It would provide data for effective control by management by indicating the level of productive efficiency and would expose causes of unproductive time. Finally it would provide the basis for labour cost control and equitable bonus incentive schemes.

On this subject of bonus schemes, Mr. Maylam said they had been brought into ill-repute because many of them had been negotiated without due regard to work content, with the result that rates had been either too slack or too tight. 'In industry today,' he continued, 'it is estimated that without financial incentive the average worker will give a performance considerably below the normal expected in return for basic wage. Even with job improvement under the stimulus of work study, a management will be fortunate if a performance of 60 standard minutes of work per hour is maintained. With an incentive bonus scheme based on work measurement, however, an average performance of 80 standard minutes per hour will be given, equivalent to 33⅓% bonus earnings.'

The Gas Industry

Mr. Maylam asked himself this question: Are industrial relations good enough in the gas industry to permit work study to be practised? Departing from his written notes he said he thought that if it could not be practised in the gas industry, it could not be practised anywhere. 'I think there are very few industries where the industrial atmosphere is better than in our own. All the ingredients of good labour relations are there, good working conditions, holidays with pay, pension schemes, information passed to all the staff, joint consultation. Therefore, there is no reason why work study should not be fully successful so far as the trade unions are concerned.' The leaders had at least indicated their approval of the application of work study as a means to increased productivity provided management was prepared to give the guarantees he had spoken of.

Describing how work study was applied to the Tottenham Division of the Eastern Gas Board, Mr. Maylam said it was carried out at the instruction of the General Manager of the Division at the request made in June, 1952 by the meter readers. This was for an increase in the bonus rate for reading gas meters. The investigation commenced in September, 1952, and involved 153 separate work studies on the district, the reading of 4,000 meters and 230 study hours.

The results achieved and described in Mr. Maylam's paper appeared to be very satisfactory but he emphasised that this job was not selected for discussion as being one where exceptional savings were obtained, but it was representative of work study activity and illustrated what could be done by the joint effort of management and men.

The Stop-watch

Answering questions in the discussion which followed Mr. Maylam's reading he first of all dealt with the problem of the stop-watch. He said he agreed that it should not be used unless it was really justified. When he was discussing stop-watches with the account collectors he said 'I would like to use one on this particular investigation because this job would be very much more efficient if I did.' If he were talking to gasfitters he would probably say 'When you run a supply from A to B you use a rule. I have a stop-watch.' But he thought that people did not like being timed on a job.

About the application of work study to the works, Mr. Maylam said he felt there would be no difficulty in setting standards for that class of work.

And on quality control, he said on all incentive schemes there was an obvious necessity to have some restrictions to maintain a standard of performance. They all knew the type of man who (referring to meter readers) tore in and out of consumers' premises and even went without his lunch to make more calls. It was reflected in his bonus earnings. They were not keen on having that type of man, because he would 'crack-up' sooner or later, and there was the question of his being, to a certain extent, a public relations officer for the Board.

Modern Printing

Having made good and frequent use of the *Modern Printers Year Book* which we received a little over a year ago we welcome the arrival of the 1954-55 edition, which is 24 pages larger than its predecessor but still, quite wisely we think, in the handy pocket size that distinguishes it from so many publications serving similar purposes. Chairman and compositor, printer and public relations officer, managing director and machine minder, printer's salesman and print buyer, have all found its compactness and portability one of its assets. Published by Bendles (Torquay), Ltd., at 4s., the *Year Book* serves as a guide on a wide variety of subjects, including block calculations, proof correcting, type specimens, calculations of words to the line, the square inch, and the page, and a definition of service to customers. The publishers state that the next issue will be published as soon as possible after the International Printing Exhibition to be held next July.

Gasification Under Pressure*

By D. HEBDEN, B.SC., PH.D.,† R. F. EDGE, B.SC.(ENG.),†
and K. W. FOLEY, B.SC.†

THERE were two problems to be solved before the Lurgi process could be applied to town gas manufacture in this country, since the calorific value of the gas, at 400 to 450 B.Th.U. per cu.ft. was rather low, and bituminous coals, even weakly caking varieties, agglomerate under pressure. Early investigations were occupied with the first of these and have been described in reports on the production of methane by hydrogenation and by synthesis. The results for hydrogenation were particularly significant in showing that hydrogen would react with coal to produce enough methane to give the required calorific value if the best use were made of the pressure available in the Lurgi process, and proposals were put forward that involved removing carbon dioxide and undecomposed steam from the gases and allowing reactions to continue in a deeper fuel bed. They led logically to the next step, which was the investigation of the initial gasification in steam and oxygen; and the Gas Research Board therefore ordered an experimental plant from the Power Gas Corporation, Ltd., to allow a study (*a*) of the caking tendencies of British coals in relation to pressure gasification, and (*b*) the gasification reactions, not only with a view to more general understanding, but in particular to see how hydrogenation could be incorporated in an integrated scheme. The plant was to have been installed at the Poole unit of the Gas Research Board, but plans were changed on the establishment of the Gas Council's Birmingham Research Station, and it was finally erected at the Nechells gasworks.

Meanwhile, the rapidly changing technical and economic scene of the post-war years affected emphasis in the research programme. In the first place, the Lurgi Company itself, separated from the lignite deposits of Eastern Germany, became more interested in the use of the bituminous coals of the Western Zone. In collaboration with Ruhrgas A.G., they erected a small generator at Holten, and, after several trials, it was shown that incorporating a stirrer in the upper parts of the fuel bed prevented agglomeration and enabled weakly caking Ruhr coals to be gasified successfully. Opportunity was immediately taken to apply this technique to British coals in the German plant, and the satisfactory results that were obtained, even with medium-caking varieties, were reported by Dr. F. J. Dent last year. While further experience is needed of generator operation, once the German tests had been made there seemed little value in continuing work on this problem in a pilot plant. Experience is required on the large scale. With a property such as coal plasticity, so much depends on physical dimensions.

Reactions in the Fuel Bed

Thus, experiments with the Nechells gasifier have been primarily concerned with an investigation of the reactions in the fuel bed, but, here again, developments have affected the approach. During the war years, with much uncertainty about the wisdom of relying on imported oil, the formation of methane in the fuel bed was regarded as perhaps the most interesting feature of the Lurgi process. It offered the possibility of producing gas of high calorific value by a gasification process using coal alone.

The work on hydrogenation had, however, already raised doubts whether methane formation is best carried out in a fuel bed undergoing gasification with steam and oxygen, or whether full benefit would not be more readily secured by using a separate stage. The post-war availability of oil, which, as an enricher, would almost certainly be used in a separate stage, has strengthened these views; and it may well prove that the question whether methane is formed in the fuel bed is of less practical importance than was first supposed. Pressure operation retains its importance as facilitating methane formation, wherever it occurs, as well as the use of low-grade coals, but the possibility of enriching the gas outside the generator clearly offers an attractive alternative to methane formation within the fuel bed.

This does not mean that the earlier point of view should be disregarded. Indeed, so many interesting possibilities are now emerging from pressure gasification that, in making a study of the operation of a pilot plant such as is described in the present report, it is best to consider the results objectively rather than to interpret them for any one application. If any particular approach has most significance, it is the use of the results to indicate what steps can be taken to increase thermal efficiency and to eliminate differences in performances as between one fuel and another. Special value is attached to the second, since the universal character of pressure gasification is one of its most important features.

Properties Influencing Gasification

Apart from caking, the properties of a fuel that influence its gasification are its volatile matter content, its reactivity to steam and the fusion temperature of its ash. Accordingly, a series of tests was made on three selected fuels of different reactivity and volatile matter by gasifying them at various pressures and with different ratios of steam to oxygen in the gasification medium.

Fig. 1.—General view of the pressure gasification plant showing the gasifier in the background, the La Mont boiler on the right, the preheater on the left, and the air compressor in the foreground.

The three fuels used have been: (i) Coal; Type 702; high reactivity and high volatile matter. (ii) Anthracite; high reactivity and low volatile matter. (iii) Oven coke; low reactivity and low volatile matter. They were selected. not so much as fuels that are likely to be gasified in practice, but

* From a paper presented to the Autumn Research Meeting of the Institution of Gas Engineers on November 23, 1954.

† Birmingham Research Station, Gas Council.

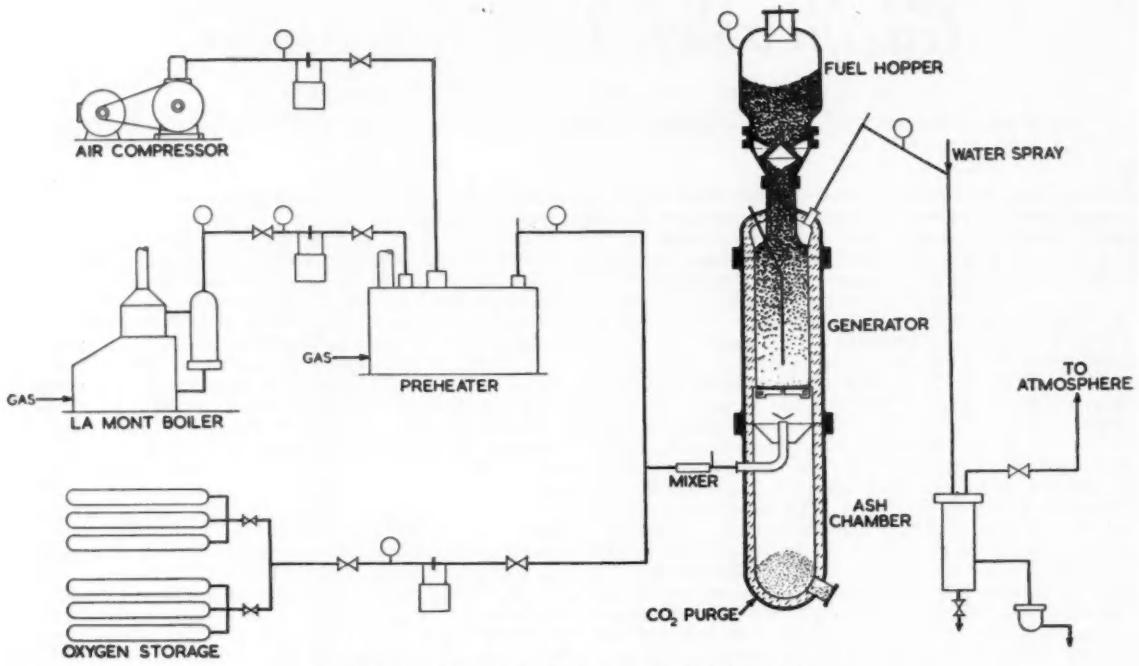


Fig. 2.—Flow diagram of the pressure gasification plant.

as representing the extremes of the variables under investigation. Each of them has been gasified at pressures of 10, 20, and 40 atm. and with steam:oxygen ratios of 10.0, 8.75, and 8.1 vol. per vol.

Normally, the rate of gasification per unit of generator cross-section has been similar to that in commercial plants as a result of using the same rate of oxygen supply. In practice the rate is determined by the tendency for dust to be carried out of the generator, and could be increased by raising the pressure above the usual 20 atm. In the present experiments, however, when using higher pressures, tests have not yet been made at these greater outputs, and, as a variable, pressure has been studied only as affecting methane formation.

The anthracite and oven coke offered no difficulty, but the 702 coal agglomerated at the top of the fuel bed. Since the generator has not so far been equipped with a stirrer, the coal was first rendered infusible by a preliminary heat treatment at a minimum temperature (500°C.) in Coalite Company, Ltd.'s retorts at Bolsover. In expressing the results, allowance has been made for the volatile matter that was then evolved.

A general view of the plant is given in Fig. 1, while Fig. 2 is a diagram of the layout. Steam is generated in a La Mont boiler and is preheated in a separate furnace, both being gas-fired. The supply of oxygen (or of air from the compressor) is led into the preheated steam, and both pass through a special mixing chamber before entering the generator at approximately 400°C. Like the rest of the plant, the generator was designed so that observations could be extended up to 50 atm.

The 702 coal contained 34.2% of volatile matter, the anthracite 4.7% and the oven coke 1%. All three were graded ¼ to ½ in. They were of commercial quality and hence relatively low in ash compared with materials that might be supplied to a complete gasification plant. The ability of a pressure generator to deal with high ash coals has, however, been thoroughly demonstrated in Germany.

One of the most serious losses in the thermal efficiency of pressure gasification arises from the use of excess steam to prevent clinker formation. It would have been interesting to have tested coals with ashes of high fusion temperature, if only to demonstrate how far this excess could be reduced by selecting coals on this basis. With the added complication of having to use a coal that could be given a preliminary heat treatment in a commercial plant, this was not possible to arrange, and the ash of both the coal and the anthracite were of average fusion characteristics. The coke had a relatively infusible ash, but, as far as avoiding clinker formation was concerned, the advantage of this was largely counterbalanced by the influence of the low reactivity of this fuel.

The high volatile matter content of the coal and the low reactivity of the fixed carbon in the oven coke had their anticipated effects. Thus, with the same rate of oxygen supply, the rates of gasification and of gas production were highest with the coal and lowest with the oven coke, the rate of gasification observed with the coal being approximately three times that normally obtained in an atmospheric pressure coal-gasification plant. Similarly, the calorific value of the gas made and the percentage of steam decomposed were highest with the fuel having most volatile matter and the highest reactivity.

The calorific value of the gas produced from the 702 coal was 405 B.Th.U. per cu.ft., and was thus similar to that obtained in the tests carried out on British coals in Germany. It was, of course, lower with the oven coke than with either the coal or the anthracite, but at 337 B.Th.U. per cu.ft. it corresponded with more methane formation than might have been expected from a fuel with such low reactivity. The anthracite gave a gas with an intermediate calorific value of 370 B.Th.U. per cu.ft.

Steam Decomposition

As a result of the use of excess steam to prevent clinker formation, the proportion decomposed was relatively low and varied from 30% to 40%. Steam consumption was, however, worse than these figures indicate, since the greater part of the steam was decomposed not by the gasification of carbon, but by interaction with carbon monoxide to produce carbon dioxide.

After allowance has been made for any tar, oil, etc., little more than 1 therm of fuel was gasified to produce 1 therm of gas. There were, moreover, only small variations in this figure between the three fuels, despite their widely different character. These observations are not surprising. The greater proportion of the potential heat in the fuel gasified appears as potential heat in the gas produced, and variations in fuel consumption are dependent upon the relatively small proportion that is burnt in oxygen to support the heat losses—viz., the sensible heat carried away in the gases and vapours and the quantity dissipated through the walls of the generator.

Differences between the fuels are therefore more apparent in the consumptions of oxygen and steam. The amount of volatile matter determines the amount of fixed carbon to be gasified and hence the amounts of oxygen and steam cor-

s med, while the reactivity of the carbon has a direct influence o the decomposition of steam.

The most practical benefit to be gained from the results f r different types of fuel is perhaps an indication of the manner i which adverse characteristics can be counteracted. The p incipal reason why the oxygen and steam consumptions w re lower with the 702 coal than with the anthracite was t at the former contained more volatile matter and less fixed c rbon. During gasification under pressure, volatile matter c mbines with hydrogen to give methane, adding to the gas y eld, without using any more steam or oxygen. But since t ere is the possibility of producing methane from oil in a separate vessel, volatile matter in the coal giving rise to m thane formation in the fuel bed has not necessarily the i portance that might at first be attached to it.

The steam:oxygen ratio should always be as low as the a oidance of clinker formation will permit; hence the importance of choosing coals with ashes of high fusion temperature. As the ratio was reduced, the rate of gasification and gas production increased and the consumption of oxygen and particularly of the steam decreased. Apart from the deliberate reduction of steam supply, these improvements arose primarily from the reduction in the loss of sensible heat when the gases passing through the fuel bed were accompanied by less undecomposed steam. Of major importance was the effect that the reduced quantity of undecomposed steam had on the amount of liquor produced.

Regarding the influence of allowing the gases a longer time of contact in the fuel bed, results show that doubling the contact had an appreciable influence on the extent of methane formation. The calorific value of the gas rose accordingly from 405 to 433 B.Th.U. per cu.ft., while the oxygen and steam consumptions per therm of gas fell from 48.5 to 42.3 cu.ft. and from 19.8 to 17.4 lb. respectively. The consumptions of oxygen and steam per 100 vol. of gas were not appreciably affected.

The primary influence of pressure increase was on methane formation which, as a percentage in the purified gas, increased from 10.9 at 10 atm. to 19.4 at 40 atm., the calorific value rising from 384 to 442 B.Th.U. The formation of methane, being exothermic, contributed heat for steam decomposition, and as a result the oxygen consumption per therm was reduced. There was a corresponding saving in steam, since this was supplied in proportion to the oxygen, while the additional liberation of heat resulted in increased rate of gasification.

Pressure had little influence on the oxygen and steam consumptions expressed per 100 cu.ft. of gas.

The production of methane by the hydrogenation reaction during pressure gasification reduces the consumption of oxygen for two reasons. First, there is less carbon remaining to be gasified in steam, and, secondly, less heat is required from the reaction with oxygen as a result of the exothermic methane reaction liberating heat in the gasification zone.

Summarising

Results indicate that the fuel bed could with advantage be increased above the existing depth of 7 ft.; there would be a greater formation of methane and, to a lesser extent, a greater decomposition of steam. The concentration of methane in the gases will, however, ultimately be limited by equilibrium and, as a result, the production, from coal alone, of gas of normal town gas calorific value will require either an increase in the pressure of operation above 20 atm., or the return of the gases to the fuel bed after they have been freed from undecomposed steam and carbon dioxide.

Volatile matter in a fuel contributes additional methane in the distillation zone, and, in so far as it lessens its fixed carbon content, it reduces the steam and oxygen demand for gasification. Its practical significance is affected by the possibility of adding a stage of gas enrichment with oil; and in this sense oil can be regarded as equivalent to volatile matter.

The deleterious influence of low reactivity in a fuel is relatively marked since by increasing temperatures throughout the fuel bed it increases both the losses of sensible heat in the gases as well as the tendency for clinker formation. It has been found that the shortcomings of an unreactive fuel can be largely counteracted by blending it with a more reactive one, the latter being preferentially gasified in the upper layers of the fuel bed.

Information has been obtained concerning the extent to which the steam:oxygen ratio can be reduced in order to avoid the excesses of steam which are the greatest source of inefficiency in pressure gasification. It appears that so long as clinker formation is to be prevented the excesses of steam needed are large, particularly with fuels of low reactivity and/or having ashes of low fusion-point. By correlation with laboratory measurements, it appears that a material reduction of this loss must involve operation with the slagging of the ash.

The investigations described are being continued with particular attention to the course of the reactions through deeper fuel beds. For this work, the generator will be equipped with a mechanical grate to eliminate the fluctuations inseparable from hand operation, and it is also proposed to fit it with a stirrer so that raw coal can be charged directly without preliminary treatment. Afterwards, the generator will be modified for slagging operation.

DISCUSSION

Mr. J. E. Davis, O.B.E. (Chief Technical Officer, South-Eastern Gas Board), commented that pressure gasification in oxygen and steam was an established procedure. Plant for carrying out this procedure could be purchased. What was less well understood was the difference between this procedure and the more orthodox gasification of solid fuels with air at atmospheric pressure. The research team reporting in this paper was helping them materially to gain a better understanding of this subject.

During the Liège Conference in May emphasis was laid on nitrogen in the blast as ballast. Its function was to carry sensible heat from the reaction zone, where the heat was liberated, to the upper levels of the fuel bed, where the sensible heat might in some measure support endothermic reactions. However, the authors of this paper showed a different picture. They showed that when working under pressure the temperature in the upper levels of the fuel bed was maintained by means of exothermic reactions. Presumably, when working with an oxygen-steam blast at atmospheric pressure there would be no ballast to carry sensible heat upwards and very little exothermic reaction in the upper fuel bed to generate heat at those higher levels. Was it experimentally true that the temperature of the fuel bed would fall off rapidly with height as heat is absorbed by the downward travelling fuel?

The evidence presented established that the predominant exothermic reaction under pressure conditions was the reaction of carbon or carbon/hydrogen complexes with hydrogen to produce methane. He wondered whether the extent of this reaction was fully realised. Many to-day were using the hydrocarbon enrichment value as a more nearly absolute measure of the efficiency of coal carbonisation than the rather ill-defined gaseous thermal yield could ever be. If they applied this criterion to the results given in the present paper, they would see that the coal was of such a type that if it were carbonised in static high-temperature carbonising plant they would expect to obtain a hydrocarbon enrichment value of about 36. When gasified in steam and oxygen at a pressure of 10 atm., the hydrocarbon enrichment value was 45.7; at 20 atm. it was 54.8 therms, and at 40 atm. it was 68.9 therms per ton of coal. This was indeed a striking achievement. Although it fell short of the 85 to 90 therms of hydrocarbon enrichment value which would be needed if the complete gasification gas were to have a calorific value of 500 B.Th.U. per cu.ft., this short-fall was less serious to-day than it would have been in former times. When Dr. Dent started his researches on complete gasification, the oil therm cost about five times as much as the therm in raw coal, and he rightly felt then that enriching hydrocarbons must be made from coal. To-day there was very much less difference between the two (in certain circumstances the difference could almost vanish), and it was perhaps unnecessary any longer to insist that all the enriching hydrocarbons should come from coal.

Mr. W. R. Branson (Deputy-Chairman, West Midlands Gas Board) suggested that little was to be gained by further work in the pilot plant stage on the Lurgi process as already established, and that the time was ripe, if it was not overdue, for the installation of a full-scale Lurgi generator in this country, so that experience might be gained of practical operating and maintenance costs with British coals. Estimates prepared by the engineering staff of the West Midlands Gas

Board in 1953 indicated that the process should be capable of producing gas of a calorific value of 450 B.Th.U. at a cost of approximately 9.0d. per therm, including capital charges, when operating at a load factor of 85% and supplied with coal costing 2.8d. per therm—that is, approximately 67s. 6d. per ton of coal, with a calorific value of 240 therms per ton. This estimate was based on an installation with a daily capacity of 25 mill. cu.ft. and compared not unfavourably with the cost of coal gas manufacture on a similar scale in the West Midlands.

The weaknesses of the Lurgi process were the low efficiency with which steam was decomposed in the generator (and the consequent large volumes of effluent to be disposed of) and the low calorific value of the gas produced, which, if the gas was to be used for town purposes, involved, in their present state of knowledge, enrichment by methane synthesis. It was clearly indicated that the research staff had considerable hopes of overcoming these weaknesses by modifications of the established process, including, first, the operation of the generator at higher temperatures, involving slagging conditions and therefore requiring reduced quantities of both steam and oxygen and producing smaller volumes of effluent, and, secondly, the use, in a separate stage, of hydrogenation of coal or oil, to increase the calorific value to any desired figure within the range likely to be of interest to the British gas industry.

The West Midlands Gas Board had for some time been interested in the possibilities of the Lurgi process. During the past six months the industrial demand for gas had increased rapidly, and the provision of more plant was under active consideration. Before a final decision could be reached, considerable difficulties in the selection of a suitable site had to be overcome. Of these difficulties, supplies of water and disposal of effluent appeared to be the most serious. Subject, however, to their satisfactory solution, the Lurgi process appeared to possess a slight economic advantage, under conditions in the West Midlands, over coal carbonising plant. The fact that such a plant would not increase the Board's requirements of coking coal seemed likely to be of decisive importance, in view of the current and, so far as could be seen, continuing shortage and high price of these coals. An installation ordered in the near future would probably need to rely upon methane synthesis for the attainment of the necessary calorific value of the gas produced.

Dr. G. Milner (Power Gas Corporation, Ltd.) remarked that the slowness with which pressure gasification in this country approached the commercial stage must give rise to a feeling of frustration. Interest in pressure gasification was not limited to the manufacture of town gas, which needed the formation of methane during gasification for the purpose of increasing the calorific value. It was of major interest in regard to the manufacture of synthesis gases. The relatively high production of methane from the more reactive types of fuel rendered them unattractive from the point of view of ammonia synthesis, but even the Durham coke, which was relatively unreactive, gave rise to too much methane for ammonia synthesis.

The authors had rightly stressed the inter-relationship between fuel reactivity and ash fusion temperature. Unless proper control of the ash bed was achieved, no gasification system employing a so-called static bed would continue to function. This paper indicated the possibility that studies would facilitate the selection of fuel for use in large pressure generators. If tests were carried out on a sufficiently wide range of fuels it should be possible to assess the potentialities of a fuel for pressure gasification in terms of its ash fusion characteristics and its reactivity either to carbon dioxide or to steam. The two factors, reactivity of the fuel and the fusion temperature of the ash, appeared to become of greater and greater importance as the concentration of oxygen in the blast increased, especially when the plant was to be operated at higher pressures.

It would appear desirable that further tests should be made in order to ascertain what results could be obtained from the more reactive fuels, such as 702 coal, when working with an appreciably lower steam consumption, provided that a fuel with a sufficiently refractory ash could be found. Alternatively, the use of a mechanical grate which would tolerate a certain amount of fusion might offset the effect of 50 or more degrees Centigrade in respect of the melting temperature of the ash. From the results achieved it was obvious that the lower reactivity of the oven cokes, even if the melting point of the ash was over 1,400°C., ruled them out for the purposes which the authors had in mind. The paper emphasised the need for fuel with a highly refractory ash or the need to develop the process on the lines of the slagging generator.

Dr. L. J. Jolly (Fuel Research Station) commented that the authors were hoping to alleviate the handicap which the existing Lurgi process suffered in requiring a steam:oxygen ratio of 8 or more to prevent the combustion temperature exceeding the fusion temperature of the ash. Dr. Hebden rightly pointed out that the greater part of this steam was wasted; even of the 30% to 40% which was decomposed a large proportion was used in the water-gas shift reaction and not in gasifying carbon. This led to an unduly heavy charge for process steam and an effluent disposal problem which in inland areas could be a great embarrassment.

The authors proposed to remedy this by turning to slagging conditions, which would enable the steam:oxygen ratio to be decreased to below 2:1 with a rise in the combustion temperature, to perhaps 1,700°C. and in the final gasification temperature to about 1,200°C. The rate of gasification would, of course, be greatly increased. It was not easy to think of any more promising way of reducing the steam:oxygen ratio than adopting slagging conditions. There was, however, a possible objection to slagging operation which had not been mentioned. Would it not give a final gas of low hydrogen content and high carbon monoxide content, which would be less satisfactory in density and combustion characteristics than the normal Lurgi gas?

Mr. N. H. Williams (Humphreys & Glasgow, Ltd.) remarked that the Lurgi process was first developed more than 20 years ago for use with brown coals, which coals were very much more reactive than bituminous coals. One could readily see why Dr. Dent had for some years been interested in a two-stage process in which hydrogenation formed the second stage, since in this way the disadvantages attaching to the use of an inherently unreactive fuel could be overcome without recourse to an extensive increase in pressure.

While he appreciated the great potentialities of such a two-stage process, it seemed to him that some means of obtaining even a marginal increase of 20 or 30 B.Th.U. in the calorific value of the gas directly in the Lurgi generator without increasing the operating pressure would be of practical value in this country. In view of the well known effect of very small amounts of soda ash in increasing the reactivity of coke to steam and carbon dioxide, one wonders whether additions of such small amounts of soda ash to the coal would have sufficient effect on its reactivity to enable a significant increase in calorific value to be obtained, and, if so, whether such additions would in fact be practicable.

It also seems that, if by any means it were possible to retain even a small proportion of the tar in the generator until it reached a zone in which hydrogenating temperatures existed, the desired calorific value increase might result. Bearing in mind the relatively slow rate of passage of heat through the coal substance, one wondered whether the use of a somewhat larger size of coal, or at any rate a proportion of larger pieces of coal, would be practicable in order to delay the distillation of a part of the tar from the centre of the coal long enough for it to be evolved in the hydrogenating zone.

Mr. D. J. Borgars (I.C.I., Billingham) said that the authors had referred to the use of a firebrick lining to the generator in order to prevent heat losses. In their work at Billingham on the gasification of coal they had the same problem, and they solved it by the use of a monolithic refractory concrete lining instead of a firebrick lining.

THE HOME OFFICE has announced that welfare workers may now be supplied with full uniform on the same conditions as other members of the Civil Defence Corps. Hitherto they have been supplied with armbands and berets only. Members of the Women's Voluntary Services, the British Red Cross Society, and the St. John Ambulance Brigade, who are also members of the section, will still be entitled to wear the uniform of their organisation—instead of the corps uniform—with the addition of the welfare section armband.

SAFETY IN GASWORKS*

By J. E. DIXON, M.INST.GAS E., M.INST.F.† and W. CUMMINGS, ASSOC.M.INST.GAS E.†

THIS paper concerns safety factors which affect the unit manager in his technical capacity. Before considering the unit, however, let us look at the gas industry's attitude towards safety precautions. This industry is energetically turning its attention to reducing the number of accidents, particularly those of a serious nature due to non-observance of elementary principles of safety precautions. The constitution of safety organisations varies considerably. Some rely on a safety officer alone, while others have faith in a safety committee. In our experience the two should not only be combined in some way but must be backed up by a keenly interested management anxious to help in making safety precautions really effective, having in mind that the practical interest of foremen and workers must be secured, and that they should take a direct part in the work of the organisation.

The unit manager is personally responsible for safety in his works. Great responsibility rests on his shoulders, for he must not only ensure that his works conforms to the many obligations of the Factories Acts, Statutory Regulations and Orders, and the recommendations of the Institution of Gas Engineers Gasworks Safety Rules Committee, but he must also ensure that his works is operated in as safe a manner as possible. In other words, he must keep within the law, and have the minimum of accidents. The unit manager should have the guidance of some higher authority, whether this be a senior safety officer or a committee of senior technical officers from various units, who should, from time to time, consider the whole problem of prevention of accidents, and where necessary prepare Codes of Safety Rules and Practice in respect of the Factories Act requirements applying to the gas industry.

Safety is not only a matter of complying with regulations; it is also a question of instruction, inspection, and supervision, and to be fully effective these must at all times be a regular part of works activities. In all but the small units, a senior technical official should be appointed to assist the unit manager in safety matters, and to act as safety adviser and instructor. In designating this officer as adviser and instructor, the title safety officer has been carefully avoided, for it is felt that where such a title is in use the foremen and staff may tend to regard the maintenance of safety precautions as his duty and not theirs. The unit manager, or the person appointed, should be able to combine safety supervision and instruction with his other duties, so long as these duties do not encroach on the small amount of time necessary for the regular and systematic direction of the safety arrangements. Time spent in precautions against accidents, even against the accident which never happens, is not wasted.

Safety Arrangements

In general, accidents are due to negligence, carelessness, lack of instruction, and most of all, lack of proper appreciation of danger. In other words, they are due to acts and defaults of the individual, whether worker or employer. The worst feature of the problem is that employees themselves provoke accidents, and because ninety-nine times out of a hundred there are no hurtful results, they become familiar with unsafe habits. Obviously then, the organisation for safety must include the safety adviser, the man in charge on the job, and the operator. But it should be centred in one person, the safety adviser, whose function is advisory and not executive, for the responsibility for safety cannot be diverted from the works management.

The safety adviser should be a senior official with a thorough practical experience of gasworks processes and operational detail. He should have a sound working knowledge of the Factories Acts, Statutory Regulations and Orders, and the Institution of Gas Engineers Safety Recommendations, and have the ability to explain these simply, but fully, to the employees. He must also be able to instruct the employees in all aspects of works safety. At first sight this may appear a formidable task, but with a little planning and thought a long-term system of short periods of instruction can be formulated.

The safety consciousness achieved by instruction should not be allowed to look after itself. It must be kept alive and fresh by the ingenuity and resourcefulness of the safety adviser, backed by the management and departmental foremen. Propaganda is essential for this and should include the various notices required to be posted in the works. During the instruction periods the importance and objects of these notices should be so emphasised, and the notices themselves so prominently displayed, that they should serve as an automatic reminder of obligations. Warning notices should also be used as strong reminders of the regulations. These notices should be of a permanent character, and we feel that some form of standardisation as regards size, type of lettering, etc., is advisable.

There are many other aids for keeping safety to the forefront, such as inter-department or even inter-works 'accident free leagues,' in order to instil a spirit of friendly rivalry. The safety adviser should be able to organise, and where necessary supervise, the compilation of injury records, the statutory and non-statutory plant inspection records, and any other relevant statistics which he may consider helpful in the drive against accidents and he should also be capable of undertaking the duties of a qualified person as defined in the Institution of Gas Engineers Safety Recommendations relating to the safe opening of plant and similar operations.

Where new plant is to be installed, or existing plant reconstructed or modified, the unit manager or safety adviser should have the opportunity of inspecting the drawings before orders are placed, so that he may check them from a safety point of view. It is desirable that no plant should be brought into operation without his final inspection and approval. He should, in case of doubt, or when faced with a difficult problem, consult the factory department.

The success or failure of safety organisation lies in the hands of the foremen, and the safety adviser must keep in close touch with them. If their interest and co-operation can be maintained, they can do much to maintain a high standard of safety consciousness throughout the works.

It is often overlooked that the Factories Act imposes a specific duty on the employee. Further duties of the employee are also laid down in the various regulations, such as the Building Regulations, which makes it obligatory for the employee to co-operate in the carrying out of the regulations, to report any defect in scaffolds, plant, etc., to close landing gates of hoists, and to use guards, safety devices, etc., provided for machinery. Employees failing in these obligations are liable to prosecution. Each new employee must be instructed so that he fully understands his obligations regarding his job under the Factories Act. The task of instructing employees, both new and old, is never an easy one, and in a gasworks it is perhaps more difficult than in most other types of works. However, the safety adviser must ensure that each employee is fully instructed in his work.

An important factor in accident prevention is care in selection of personnel. Nowadays, there is often no choice in filling a vacancy, and we are only too glad to get anybody without worrying too much whether he is the right man or not. Such a position is unfortunate, but while it exists extra care must be taken with instruction. Whenever a choice does exist, however, great care should be made in selection from the points of view of ability, health and physique, and general character.

Although the safety organisation in a works should be centred on one person, the safety adviser, he can, and should,

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* Abstract of a paper to the North of England Section of the Institution of Gas Engineers, November 25, 1954.

† Northern Gas Board.

receive a great deal of assistance from the works committee. Safety is essentially a joint activity. All aspects of safety in the works should be discussed in committee. Recommended safety measures arising from accidents which have occurred should be submitted to the committee for consideration before being put into effect. Employees should be encouraged to submit any suggestions for safety, and the committee should help in the arranging of inter-works or departmental safety competitions.

Every safety organisation should provide an efficient system of preventive inspection. To be efficient inspections must be systematic and be carried out by a person who not only has the knowledge of where to look for faults, but also has the ability to anticipate the development of defects. In addition, all employees should be encouraged to look for and report any unusual circumstances or defects.

The examination of certain plant under working or standing conditions at frequent specified intervals is, of course, an essential requirement of the Factories Acts and allied Regulations. Such examinations are usually carried out by the specialist staffs of insurance companies. In a gasworks the non-statutory inspections, in effect, cover all the plant and equipment in the works. However, they may be divided into three main groups: First, the equipment concerning which statutory inspection is necessary. Statutory inspections should be backed up by independent works inspections at fairly frequent intervals. The second group comprises equipment the actual inspection of which is not required under the Acts, but is, nevertheless, implied by them. The last group covers the remaining plant in the works, which means that nothing which can lead to safer working conditions must be neglected.

Administration

No safety organisation can be fully effective unless it is backed by efficient administration. This administration will obviously vary in different units or areas, but it must be capable of dealing with at least four main aspects of safety precautions: (1) Notices and notifications; (2) plant inspection records; (3) accident investigations; (4) accident statistics.

Under the Factory Act and allied Regulations certain notices are required to be posted in a works at specified points, or fixed to certain appliances. The regulations also require some reports to be sent to the Inspector of Factories for the district, or to the factory doctor. In addition to these statutory requirements there are also notices which are recommended by non-statutory bodies such as the Institution of Gas Engineers Safety Rules Committee, and the Area Safety Precautions Sub-Committee; and we would advise treating such recommendations as obligatory.

Records are essential to any system of inspection, and the administration of the safety organisation must be capable of dealing with the records of the preventive inspections, both statutory and non-statutory. When an accident has occurred the full circumstances should be investigated and a comprehensive report of the occurrence made. This should be done as soon as possible after the accident. In no circumstances should the investigation take the form of trying to put the blame on someone for the accident. All accident investigations should establish the pertinent facts; consider what could have been done to prevent the accident; determine what has already been done, as an emergency step, to prevent a recurrence; and recommend what should finally be done to prevent a recurrence.

Accident statistics are an important section of the administration of a safety organisation for its success. To obtain the maximum value from the recording of accidents or dangerous occurrences, great care must be taken in deciding the method of compiling all the relevant particulars. The essential facts of each case must be so assessed that the significant points are immediately available for comparison with past records. A study of these records may reveal a predominant weakness in the chain of safety measures, and make it possible to decide upon the introduction of suitable precautions.

Design

In order that safety may be properly taken care of during the design stage, the designer or draughtsman should have a good knowledge of the requirements of the Factories Acts, and other Regulations. In fostering this we suggest that during the planning of new plant, provision should be made for regular consultation between the design staff, the operating engineers, and the safety adviser; that when a new plant has been installed a report from the safety point of view should be made by the operating staff and safety adviser during the initial stages of operation; and that whenever possible standard specifications should be laid down on the lines of the Institution of Gas Engineers Safety Recommendation M.6.

The presence of contractors in a gasworks often gives rise to misunderstandings regarding the responsibility for the fulfilment of the Factories Acts. Although in some cases the position can be complicated, we feel that certain fundamental points will help the unit manager to assess his responsibilities. Briefly the position may be split into four cases: (*a*) Where the site on which a contractor is working is part of an existing factory; (*b*) where the site may be regarded as a separate part of an existing factory; (*c*) where the site may be regarded as a separate factory; and (*d*) where the site is in itself not a factory.

In general the first of these is the one more often encountered on a gasworks, and in all such cases the implementing of the Factories Acts is the responsibility of the unit manager as occupier. Even where the Acts place certain obligations on the contractor to see that particular sections of the Acts are fulfilled (as in the case of building operations, or works of engineering construction) these obligations are in addition to those of the unit manager, who is still responsible for the whole of the Act, and who must ensure that the contractor observes all the regulations.

There are, however, some cases where the site may be considered as falling into one of the three remaining categories. In such cases the contractor becomes the occupier for the purposes of the Act, and the unit manager has no obligations to ensure that the Act is implemented. The difficulty in these cases lies in deciding when a site is a separate part of an existing factory or a separate factory. No hard and fast rules can be laid down; each case must be considered on its merits, but to be so considered, a site must at least conform to the definition given in the Act, which states that it must be solely used for some purpose other than the processes carried on in the factory.

DISCUSSION

Mr. W. R. Garrett (Chairman of the Section, Newcastle-on-Tyne), in connection with the authors' reference to design plans being considered from a safety aspect before being finally passed, said that difficulty arose when the many drawings associated with a big contract had to be considered from a safety aspect. It was a problem which was not always tackled, and the safety officer was apt to be overlooked through the pressure of work on hand at such times.

Mr. Nixon agreed with the Chairman that the examining of design drawings from a safety aspect in a large contract was difficult. Visits to plants similar to those proposed would often yield valuable information in relation to safety.

Mr. J. E. White (Newcastle-upon-Tyne) said that consultation between the design staff and all works' officers was necessary during the design stage, and such consultation should be continued as the contract proceeded.

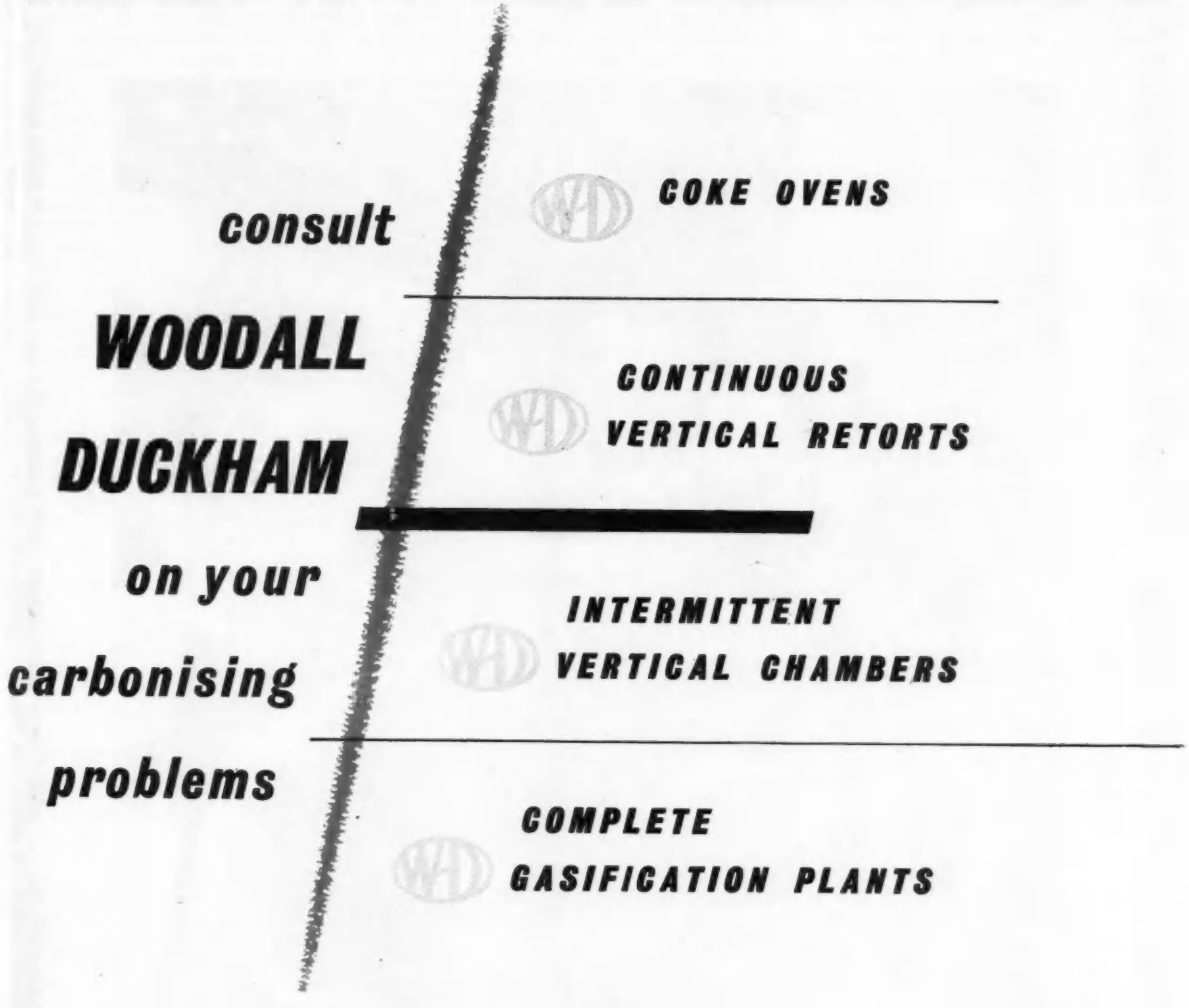
Mr. P. N. Lee (Middlesbrough) said it was a duty of management to see that safety measures were carried into effect. Operatives should in all cases be prevented from taking fool-hardy risks.

Mr. Dixon, agreeing, commented that co-operation was the essence of success.

Mr. J. McManus (Wallsend-on-Tyne), referring to the selection of personnel, said it was difficult to recruit suitable employees in industrial areas. As a result, those who might be careless had to be accepted in order to maintain an adequate labour force. He spoke of co-operation, not only with contractors, but also with H.M. Inspectors of Factories on new contracts. In many cases the co-operation of H.M. Inspectors would save a great deal of subsequent correction of faults when the plant was handed over by the contractors.

Mr. Dixon said he appreciated the difficulties of recruiting proper labour. He could only recommend perseverance in training for safety measures.

Mr. Garrett said that many contractors now specified a list of guards they proposed for a contract. Collaboration at an early stage with H.M. Inspectors could be useful. Unfor-



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and a Prosperous New Year.

FLAVELS of LEAMINGTON

tunately, no two inspectors necessarily had identical ideas on Codes of Practice.

Mr. J. R. Clark (Keswick) suggested that foremen should collaborate in transferring safety ideas from management to operatives. It was, of course, much easier to realise the safety requirements of a plant after it had been built than from perusal of working drawings.

Mr. K. W. Francombe (Whessoe, Ltd.) said that the requirements of safety in specifications were welcomed by contractors because they in turn could quote to a fuller specification. From his experience, he had found that collaboration with H.M. Inspectors of Factories had been most helpful. Contractors could, in the light of experience, make recommendations for safety on well-known types of plant, but it was in the prototype stage of new plant that difficulties could often only be revealed in the light of experience. He referred to the excellent work of the Institution's Chairmen's Technical Committee and the valuable Gasworks Safety Rules Committee. He also mentioned the value of the Institution's publications of unusual incidents in Gasworks.

Mr. W. Brittain Jones (H.M. Inspector of Factories, Middlesbrough) felt that many of the alterations which were necessary to contracts after completion came as a result of experience. He welcomed, as he was sure all his colleagues would, an invitation to look over drawings and proposals before plant was erected. A clear specification was undoubtedly helpful in deciding the measure of protection. He referred to the present-day practice of the Factory Inspectors of reporting particular hazards to their engineering department in London, who in turn approached the various manufacturers of a type of equipment in order to standardise safety measures. As one man only dealt with all the manufacturers of any particular type of plant, the recommendations of the department would therefore be uniform for that type of plant. The normal run of plant could be fairly easily assessed from a safety viewpoint, but often similar plants varied extensively in detail from works to works, and this resulted in a different safety approach to each. Help would always be willingly given; and inspectors who specialised in engineering, chemistry, health, and electrical installations, were always available.

Mr. K. E. Brown (Newcastle-upon-Tyne) said that distribution personnel should have a reasonable knowledge of the hazards on works, as they were required to operate in the works from time to time.

Mr. G. E. Haddon (Stockton-on-Tees) commented on safety measures in the distribution and utilisation of gas.

Mr. G. E. Anderson (Newcastle-upon-Tyne) referred to what was sometimes called a 'pure accident', where apparently all the rules had been applied, but still the accident happened. How could this type of accident be avoided?

Mr. Dixon, in reply, questioned whether there was such a thing as a 'pure accident'. He felt that in almost every case, a cause could be found.

Mr. J. W. Pallister (Middlesbrough) supported the authors' suggestion on 'accident-free leagues', which could result in a helpful spirit of friendly rivalry.

Mr. W. Sutcliffe proposed a vote of thanks to the authors, and Mr. Dixon replied on behalf of himself and Mr. Cummings.

Spray-Drying: A Notable Conversion

Among the latest reports of the Industrial Gas Development Committee of the Gas Council is one describing a most interesting conversion from oil to gas firing in a spray-drying plant employed on the drying of a synthetic cream. This report (569/54) details work carried out by the North Thames Gas Board at the premises of Phillips Yeast Products, Ltd., in North London, where there is a spray-drying installation made by the Kestner Evaporator and Engineering Co., Ltd.

For the drying of the product in question, spray-drying is particularly suitable. In the first place, prolonged heating would cause deterioration of the synthetic cream; second, high temperatures would harm the product; third, with spray-drying, the product leaves the drier in powder form, as marketed, and no further processing is required.

The Kestner drier was designed to evaporate 200 lb. of water per hour. The dried material was discharged containing 1% of water. The rate of evaporation was 265 lb. per hour. The output of the drier is governed by the volume and temperature of the hot air delivered and by the nature of the material to be dried. The air heater is capable of burning 3,000 cu.ft. of gas per hour, though, for process reasons, the gas rate in practice was less than this.

A disadvantage with oil was that the air-heater, which was indirect fired, had to be accommodate outside the main building, on account of fire risk. Consequently the time taken to attain running temperatures was much longer than normal under severe weather conditions.

With gas, it was possible not only to house the heater in the same building as the drier, but also to use direct firing, since the products of combustion do not harm the material to be dried.

Gas enters the system through a 3-in. supply connected to a Keith Blackman type N.G. size 0 booster with A.16 motor and a Keith Blackman low-pressure cut-off switch. The gas then passes through a horizontal 3-in. pipe fitted with a 3-in. Keith Blackman non-return valve, a 3-in. Crawford governor, a 3-in. type 60 Perl magnetic gas valve, and a 3-in. main cock.

The fan previously used to push cold air through the oil-fired heater has now been moved, and is employed to blow cold air through the gas-fired heater. Square ducting is used to convey the air at both the inlet and outlet ends of the heater. Two Ether diaphragm type air-flow switches are below the Crawford governor. These are set at 1 and 3 in. W.G. respectively, and ensure that gas is admitted only when the pressure in the combustion chamber is between these values. A Perl type 52 thermostat in the outlet duct operates a proportional control system in conjunction with the Perl type 60 magnetic gas valve already noted. The burner thus controlled is a No. 2500 Hypact burner.

Control of the system is effected by an Elcontrol F.S. 5M unit, as described in I.G.D.C. Technical Report No. 560/53, D 0365. The associated viewing head is directed towards the flame from the Hypact burner, which it views through an armoured glass inspection port.

Performance

A batch, which weighs 426 lb. and contains 47.5% of solids, can be dried with ease in 50 min. whatever outside air temperatures prevail. The drying time can be reduced to 30 min. if a moisture content of 2% can be tolerated. Starting-up procedure was simplified by the installation of automatic control (The Elcontrol F.S. 5M functions as described in I.G.D.C. Technical Report No. 560/53). A fully automatic recycling mode of operation is employed with a purge time of 2½ min. During the period of 72 working days to which the results refer, the time elapsing between the establishment of the flame and the opening of the liquid feed valve was usually about 11 min.

A measured maintenance gas rate was 1,450 cu.ft. per hour. The average gas rate varied each day between 1,000 and 1,800 cu.ft. per hour, with an average of 1,443 cu.ft. per hour over the 72-day period. The average gas rates include the full-on initial rates necessary to heat the plant at the beginning of the day and the periods when the gas was shut off while no material was being dried.

The number of batches put through the drier each day varied from 3 to 11 with an average of 7.35, though the plant was designed for continuous operation. The heat required to process a batch was about six therms.

If the efficiency of the drier is expressed as that fraction of the heat input by combustion required to raise the temperature of the water in the feed and to evaporate it, then the average efficiency over the period of 72 working days was 39.6%.

The costs of running the oil-fired and gas-fired air heaters are comparable under prevailing conditions, if maintenance costs are ignored, and these are negligible for the gas equipment. The consumer regards the ease of operation possible with the automatically controlled gas-fired air-heater as a great advantage.

CATALYTIC OIL GASIFICATION

We give some notes on the discussion which followed the two papers on this subject which were presented to the Research Meeting of the Institution of Gas Engineers.

Dr. R. H. Griffith (London Research Station of the Gas Council), opening the discussion, said these two papers made a very important milestone on the way to development of a process for the gasification of any type of oil. The three points he wished to take up were the chemistry of the gasification reactions; the catalysts which are used in the process; and one or two things connected with possible future developments of the plant.

In hydrocarbon oils the carbon/hydrogen ratio was much nearer to that in methane than it was in coal, and one could get quite good yields of gas merely by heating the oil to a high temperature. Such a process of simple carbonization, however, led to the formation of coke or asphalt or both and in that way reduced the efficiency of the process. But if hydrogen or oxygen or steam was provided in the process, to a large degree, that loss in the form of deposits either of pitch or coke, could be prevented. The use of hydrogen for this purpose had been practised for a long time in the conventional C.W.G. process where extensive hydrogenation of the oil occurred. That process had a high efficiency provided the right sort of oil was available, i.e., it must be one with a high content of open chain hydrocarbons. The same limitation applied even to the modified carburetter described by Mr. Diamond.

Dr. Griffith said that steam was rather more attractive in several respects, and it offered a possibility of providing reasonably good efficiency at a reasonable cost. Any hydrocarbon would react with steam if the temperature was high. The reactions were always endothermic, and accordingly heat had to be provided from an external source. At the same time, because the temperatures were necessarily high, there was a good deal of purely thermal cracking. The overall result was a mixture of gases extraordinarily like the present carburetted water gas.

The inventors of the Onia-Gegi process and the research staff of the Institute of Gas Technology in Chicago said they were quite convinced that the British technologists were barking up the wrong tree when they used lime. But Mr. Stanier and Mr. McKean were equally convinced the others were wrong in using nickel.

When it came to the point of putting this process to work, the characteristic features of the process were, he thought, considerable fluctuation in the conditions of very severe treatment of the catalyst, and deposition of all kinds of undesirable substances of cokey or pitchy character. When one has problems of that kind in certain other fields of organic chemistry it was customary to look at the possibility of using the catalyst in a fluidised state. He asked the authors whether they had considered the possibility of using a larger grain size which would not be carried from the system because of the high gas velocity, but would still be in the form of a moving bed and could be circulated through regeneration and returned to the system after cleaning up.

Mr. C. H. Chester, C.B.E. (Chairman, South Western Gas Board) said Mr. Diamond had surveyed the availability of oils suitable for gas making, but perhaps the most important aspect was the variable composition of the oils. For this reason there was no rigid definition of heavy oil neither was there any specification, and therefore from time to time conflicting experiences had been reported.

For a number of years, Mr. Chester said, he had been interested in the cracking of heavy oil, originally in order to provide gas as a primary product, but more recently to provide carbon of a special type suitable for sale to the rubber industry, the gas being of secondary importance. The transfer of their efforts primarily from gas to carbon was forced upon them by the great trouble the carbon caused in plant blockages, and in making the tar so difficult to handle, and so poor in quality, that something had to be done about it. Incidentally, he noted that, in calculating costs, Mr. Diamond has allowed a credit for tar and it would be interesting to know the basis upon which he arrived at the value of the tar.

Mr. H. Johnston (North Eastern Gas Board) confined his remarks to the paper by Mr. Stanier and Mr. McKean, and referred mainly to experiences gained with a 'Segas' plant installed by the North Eastern Gas Board at York. This plant was ordered in 1951. Its construction by the Power Gas Corporation followed the plant then being installed at Sydenham. The York plant was nearly identical with Sydenham, but with knowledge of early experience there, certain modifications were incorporated. Thick viscous tar was expected. To cope with this, a specially designed wash box with means for raking out, was provided. This had since proved unnecessary. To minimise pipe blockages, acute bends were avoided. A multifilm oil static washer was installed for naphthalene removal. The oil gas joined the water gas stream and had the advantage of an electrostatic detarrer. To minimise the effluent problem, cooling water from the Lymn washer with wash box liquor, was circulated over a cooling tower after passing through the tar separator. The circuit was a closed one, and virtually, so far, there has been no discharge of effluent to drains.

With minor differences to suit local circumstances, operation was based on Sydenham, with the one major exception that the whole of the oil was injected into the top of the steam pre-heater. This had resulted in improved performance of the catalyst, with better temperature conditions and control. The authors predicted with this practice, damage to pre-heater chequers, and this had in fact taken place; but a recent examination had shown no marked deterioration of the catalyst. The authors' suggestion that future plants should incorporate a vaporising chamber was, Mr. Johnston thought, a good one.

It was soon found that injecting the whole of the oil into the steam pre-heater resulted in maximum temperatures lower than at Sydenham, when using similar oil and making gas of the same calorific value. Comparison indicated this difference to be about 50°C. The range of temperatures appeared to be closer, the heat being more evenly distributed, suggesting a fuller use of the whole catalyst.

The use of excess air, during the blow, for control of catalyst temperatures and calorific value, as practised at Sydenham, had in the main been adhered to at York. Lower temperatures necessitated increasing the air/oil ratio, causing a progressive drift of heat in the direction of the steam pre-heater, from the air pre-heater and catalyst bed base. The extent of cooling was such that deposited carbon remained unburnt. Gas-making was frequently suspended, for burning off and clearing blockages. Partial rectification of these undesirable conditions was attained by reducing the oiling period and increasing the oil injection rate.

Occasional burning off became a feature of routine operation. At first this was accompanied by the production of some smoke, when the gas burner at the air pre-heater base was used with the secondary stack open. Smoke could not be countenanced at York. Elimination of smoke during burning off was accomplished by providing a gas connection at the top of the pre-heater, burning downward through the hot zone to the main stack. Any tendency towards smoke emission during operating cycle had been counteracted by maintaining steam pre-heater top at about 650°C.

Operation at York had been confined to the use of heavy fuel oil of the same characteristics as quoted by the authors; the main exception was that the sulphur content was nearer 4% than 3%. During the last month or so, prior to distortion of results occasioned by damage to catalyst vessel lining, there was little or no naphthalene in the gas, even at the wash box. Blockages by pitch had not been common. The free carbon content of the tar was 9% compared with

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15% quoted in the paper. Emulsification had not been particularly troublesome. Tar deposited in the wash box flowed readily to drain while the plant was working, but thickened somewhat on cooling. Batches of tar pumped away were less viscous than the oil used. Tar had been sold, the price received being the same as that received for coal gas tar, and in excess of that received for C.W.G. tar.

Control of calorific value, as the authors pointed out, ultimately rested with the ability to control catalyst temperature. He would say that this relationship was extremely critical. Control at present was attempted by carrying away heat surplus to requirements by an excess of air during the blow. This control was not a complete one, since control of the air itself was not sufficiently fine. Providing bed temperatures were maintained by excess air within reasonable limits, there did not appear to be any reason why final control within fine limits should not be accomplished by slight variations in the oil rate. Such slight variations had no appreciable effect on carbon deposited, but they were large enough to affect the unsaturated hydrocarbon content and hence the final C.V. of the gas.

In any future plant, he would like to see arrangements provided for back-running, because such an arrangement would tend to level temperatures throughout the depth of the bed. Having got so far, he thought that ideal conditions might be approached by replacing the static catalyst with a fluidised one. This would allow uniform temperatures throughout the bed, and absolute control of gas and products.

The main results at York compared with those quoted in the paper, using similar oil and making similar gas, were:—

	Sydenham.	York.
Gross C.V. crude oil ...	18,260	18,090
Gross therms/gal. of oil ...	1.25	1.214
Net therms/gal. of oil ...	1.18	1.164
Steam/oil ratio	1.31	1.09
Lb. steam/gal. oil	21.16	22.44
Tar made per 100 gal. oil ...	10.4	12.7 (approx.)

It was not yet possible to quote accurate costs for York after only three months working, but a rough assessment for similar gas and oil indicated similar costs, perhaps a shade higher for York. Incidentally, he did not see in the authors' costs any inclusion for steam. The authors pointed out that the plant could not be wholly self-supporting, and therefore he would have thought steam would be a charge against the process.

Mr. N. H. Williams (Humphreys & Glasgow, Ltd.), commenting on Stanier and McKean's paper, said that under the heading 'Use of other Catalysts,' the statement was made that nickel catalysts tended to give gas of too low a calorific value by destruction of CH_4. In fact the Onia-Gegi catalyst, which contained nickel, had been used to produce gas of nearly 1,000 B.Th.U. per cu.ft. Moreover, the gas analyses given by Mr. Diamond showed higher methane contents than the combined methane and ethane figures given by Messrs. Stanier and McKean. Indeed, the relatively high contents of unsaturated hydrocarbons in the 'Segas' analyses might indicate a mixture of thermal cracking and catalytic gasification.

Stanier and McKean had remarked that nickel catalysts appeared to be more sensitive than lime-magnesite to high temperatures, but he was aware of no evidence which permitted such a generalised statement to be made, and it certainly did not apply to the Onia-Gegi catalyst. His contacts with the work on the regenerative plant at Solihull led him to say that the true answer depended on what conditions within the plant had to be fulfilled in order to operate the particular process satisfactorily. Heating even the theoretical amount of air to catalyst reaction temperature could absorb all the heat which was recoverable from the make gases and undecomposed steam if condensation of tar was to be avoided. Similarly the waste gases from this theoretical amount of air would carry away from the catalyst bed more than enough heat to preheat the steam. The excess of air actually used carried away from the catalyst bed roughly the same amount of heat as the saving calculated in the report and, therefore, cancelled out this saving.

Members might have wondered why the figures for oil conversion efficiency given by Mr. Diamond for Stafford were not as good as those given for Solihull with the same catalyst and with oil from the same source. Both the organic sulphur and H_2S contents were also much higher at Stafford. The reason for these differences was that the oil distribution device in use at Stafford, which had been found satisfactory on Continental plants of similar size, had proved unsuitable for use with the types of heavy oil usually available in this country, and produced uneven distribution of the oil and steam over the catalyst. This had now been confirmed by trials on French plants of similar size already in operation. Full scale trials had shown how to modify the oil distribution equipment to give the desired distribution, and the change was about to be made at Stafford.

Mr. Diamond had referred to the possible use of petrol by the gas industry, and Messrs. Stanier and McKean referred to the reforming of refinery gases in laboratory tests. Full scale Onia-Gegi installations had for some time been at work on the Continent reforming methane (in the form of natural gas) for the production of town gas, and an installation was on order in this country for reforming mine gas.

In fact, the use of such low molecular weight hydrocarbons was relatively easy, and this was illustrated by the fact that various American processes, which would reform CH_4 and light hydrocarbons, had been found incapable of using heavy oils. The gas industry in this country now had available to it two processes which could use the whole range of products of the oil industry from heavy fuel oil to refinery gas, as well as natural gas if it became available. At the same time a change had recently come about in the oil industry in this country whereby the demand for, and hence the relative values of, its various products had been considerably altered. Mr. Williams said he believed that the gas industry would be well advised in future discussions with the oil industry to have in mind the extraordinary flexibility of the new catalytic oil gasification processes as regards raw material.

Mr. W. Byrom (Manager of the Gas and Oil Section of the Esso Petroleum Company) said that with the exception of conditions to which the term 'force majeure' could be applied the oil industry had never failed to meet the quantity demands placed upon it. By way of illustration, world-wide production of petroleum totalled 265 mill. tons in 1938, and reached a figure of 675 mill. tons in 1953. It would also be true to say that such production had generally been in advance of consumption. Oil was essentially international, and by reason of this fact, a general balancing of product demand could be accomplished. It would be incorrect to assume that supply could not meet demand, or that the maximum consumption of fuel oil had in any way been reached in this country. If industrial production was to increase in the United Kingdom, then the additional fuel and power requirements must be met. It would appear that the coal industry would be unable to meet the increased demands for energy; availability of atomic energy was still 10 years ahead; therefore petroleum fuel and improved efficiency in the utilisation of coal were the only alternatives to a situation where the steady development of industrial production would be limited.

He was confident that both Esso Petroleum Company and the petroleum industry in this country would not fail to meet the necessary demands placed on them in this connection.

The **President** announced that the authors would reply in writing.

SMOKE POLLUTION

An observing station for measuring the smoke and sulphur dioxide pollution in the London atmosphere has been established in the Science Museum by co-operation with the Fuel Research Station of the Department of Scientific and Industrial Research. The station is one of a number that are being established to permit a more detailed examination of atmospheric pollution in London and elsewhere.

The sampling equipment is displayed as a working exhibit in the Meteorology gallery. The smoke particles are captured on filter paper through which air is drawn from just above museum roof level, by means of a small electric pump. As a result, a grey stain appears on the filter paper, the intensity of which is a measure of the degree of smoke pollution. The same air is bubbled through a weak solution of hydrogen peroxide where the atmospheric sulphur dioxide is dissolved to form an acid solution, the strength of which is measured by standard chemical methods

GAS CONSULTATIVE COUNCILS

The Fifth Year in the Southern Area

At a recent meeting of the Southern Gas Consultative Council Mr. A. R. McBain, Chairman of the Southern Gas Board, gave a review of the Board's fifth annual report and accounts. He said that since the end of the financial year there had been substantial increases in the sales of gas appliances as compared with the past year, especially in gas cookers and gas water heaters, and that there seemed reason to believe that the upward trend in the sales of appliances would continue. Reference was also made to the successful introduction of budgetary control in the Bournemouth undertaking, of which the Board was the pioneer in the gas industry. The Board had decided ultimately to introduce this system throughout the area. So far as it was possible to see at the moment, Mr. McBain stated, there did not seem to be any immediate prospect of an increase in the present price of gas.

Mr. S. E. Whitehead, Deputy Chairman, gave the Council information on the general technical aspects of the Board's activities. The biggest problem the Board had to contend with, he said, was that of coal. Due to the introduction of mechanical plant in the pits there tended to be an increase in the inert content of the coal received—*i.e.*, there was a higher amount of rock and slate in the deliveries received. In the past it had been possible to have a choice of coals but now there was very little selection possible. The Board had investigated the possibilities of using substitutes for coal. Some heavy oil could and would be used, but this would mean some delay and the installation of certain new plant. Mr. Whitehead then gave information on other processes which were receiving the Board's close attention.

Referring to the 'Fawley Flame' and the utilisation of tail gas, which was a subject raised by the Council at an earlier meeting, Mr. Whitehead said that recent meetings had taken place between the Esso Refinery and the Board and though they had not yet come to any real agreement, they were getting nearer to a basis where the Board hoped it would be able to use some of the Fawley gas.

Councillor H. Sanders (Farnham) enquired whether there was any prospect of the underground storage of gas in place of the present method of using gasholders which were often considered unsightly. Mr. Whitehead said that in the smaller sizes high pressure holders, in the form of long cylinders, were used but for the larger sizes there did not seem to be any alternative to the present type of holder. Mr. McBain added that the subject of storage had been receiving the attention of the Gas Council in connection with the search for natural gas and that if the search proved successful it was conceivable that the Gas Council would evolve means which would be suitable for the storing of larger quantities of gas.

Colonel G. P. Durham (Portsmouth) asked whether, taking a long-term view, it was possible that coke would in the future be practically unobtainable owing to its increased use by the industry itself. Colonel Durham said he had in mind the use of coke burning fires and other appliances in which coke was now used so efficiently. Mr. McBain stated that they had had to import coke into the area this year as they had produced less owing to the necessity of shutting down a number of retorts for re-setting and also due to the closing down of the North Bank works at Oxford. Another reason for the importing of coke into the area was that the Board wished to build up its winter stock in view of an anticipated rise in coke usage. Mr. McBain was of the opinion that coke would not disappear as it was being recognized that the carbonization of coal was the best method of obtaining the various by-products.

Councillor Monard (Portsmouth) asked whether future annual reports of the Board could be improved by the provision of a few more simple graphs as to the numbers of consumers, sales of gas, etc. Mr. McBain said he thought this a good suggestion and he would bear it in mind in the future.

A vote of thanks to Mr. McBain and the members of the Board and senior officials was moved by the Council's Deputy Chairman, Mr. J. E. Thomas. Mr. Thomas said he was pleased to learn that a new gasworks was to be erected at Cowley, which he was sure would remove a great deal of anxiety from the minds of the people of Oxford. In referring to Mr. McBain's remarks that he viewed the members of the Council as close partners in the aim of providing a first-class gas service at the lowest possible cost, Mr. Thomas said he thought it would be true to say that the members of the Consultative Council would be agreeable to be partners, often critical but always constructive.

Millennium of Cheap Gas

Sir John W. Stephenson, C.B.E., Chairman of the Eastern Gas Board, addressed the November meeting of the Eastern Gas Consultative Council (Lieut.-Colonel R. I. Musson, M.C., in the chair), on the Board's fifth annual report and accounts, which showed that the Board had a deficiency of £47,322 compared with a surplus last year of £364,263. This year the Board withdrew from the income tax equalization account the sum of £30,000 which reduced the net deficiency to £17,322. This deficiency had been set off against the credit balance on net revenue account brought forward from last year, leaving for future needs the sum of £172,987.

He said he felt the Council would agree that the Board's policy of leaving gas prices undisturbed during the year, notwithstanding the increased costs which the Board was called upon to bear, was fully justified by the financial results. Coal, for instance, was up by 6s. 7d. per ton and cost the Board £528,000 more than last year; this was equivalent to a rise of approximately 7½%. Wages and salaries were up by £217,000 or slightly less than 6%, and local rates cost an additional £20,000.

On the income side £133,000 more revenue from gas sales through increased consumption was received, while coke yielded an additional £276,000, partly due to an increase in the price charged for it and partly because of higher yields per ton of coal carbonized. In the field of appliance sales, the gross income was up by approximately £500,000. The Board's sales per 1,000 domestic consumers were the highest for any board and a generally high level of sales had been achieved over the whole field of appliances.

During the year expenditure on capital account was over £2 mill., bringing the Board's capital expenditure since vesting day to more than £10 mill. In each of the previous financial years the capital expenditure on gas manufacturing plant had been greater than on the distribution systems, but last year the position was reversed and slightly more than 50% of capital expenditure was on distribution and consumer service, and this trend was likely to continue as integration schemes were carried out. For example, 200 miles of new mains were laid during the year, which included the mains for the joining of smaller works with larger ones, as well as distribution mains in new towns and other housing schemes.

New Gas Production Methods

Coal, the raw material of the industry, was in short supply and its cost high; the industry was, therefore, looking round for alternative means of making gas. With increased supplies of oil in this country, new techniques for the manufacture of gas from heavy oil (as opposed to enriching carburetted water gas with gas oil as had been the practice in the past) were being explored. Three oil plants were being installed in the Board's area—these would be situated at Ponders End, Luton, and Thetford.

Another system being introduced was the manufacture of gas from weakly-caking coals by complete gasification, and in this connection the Board had placed an order for a plant of 2 mill. cu.ft. a day capacity for its Watford works. There was more weakly-caking coal available than the traditional carbonizing coal, and it was cheaper.

The Gas Council was prepared to spend £1 mill. over the next five years

in exploring for natural gas in this country. The search was being energetically pursued, and one or two strikes were promising. If enough natural gas was found in any quantity, the energy pattern of this country, indeed its economy, might well be completely changed. This £1 mill. was for exploration only, and not exploitation. A great deal of money would have to be spent if natural gas was found in any worthwhile quantities.

Oilfield Waste

There was another development which the industry was pursuing with much vigour. Enormous quantities of natural gas were running to waste in the oil fields of the world. If the cost of bringing the liquefied gas to this country was such as to make it a commercial proposition, then the dependence on coal would be considerably lessened. The gas industry was considering this question very seriously. The Chairman said he did not want to convey that a millennium of cheap gas was likely to occur in the very near future; it might well be that the next decade would reap the benefit of the exploratory work being done by the research workers of today.

Sir John also reviewed the first five years of nationalisation. On taking over the Eastern Gas Board brought together 92 separate undertakings, with 446 tariff structures, a mountain of maintenance and repair work left undone during the war, and all the uncertainties that followed. With these formidable arrears of work the Board inherited a substantial loss. The task that lay in front was that of deciding how to serve the interests of consumers and, at the same time, observe the directions given to the Board of balancing accounts, taking one year with another. The Board decided to plan with the interests of the consumer as its one fixed purpose. The Board, following its original survey, planned to hold prices until it could see clearly what was needed in order to discharge its obligations to and in the interests of the consumer and according to the provisions of the Gas Act.

Barest Minimum Price

The Board had not solved all the problems, and many of its plans were still in the process of being worked out, but, on looking over the past five years, he could say with some satisfaction, that it had achieved a great deal. First and foremost, it had kept down the price of gas to the barest minimum. Notwithstanding the tremendous increase in every item of expenditure which the Board had had to meet since vesting day, which, after taking into account increased receipts from by-products, amounted to 7d. for every therm of gas sold, the price of gas on average had increased by only 4d. a therm, thus saving the consumer on average 3d. a therm. The Board with the assistance of the Council took a bold line. It abolished the 446 tariffs and substituted six, and it fixed a common prepayment supplement. Since then the Board had not allowed the shadow of mounting costs to obscure its view. From December, 1951, to August of this year the price of gas had remained constant. Regrettable as it was, the Board last August had to increase the price of gas in order to keep its finances under control.

Sir John thought it could be said with some degree of pride that in the fifth year of the Board's life the harvest had been quite abundant and the consumer had benefited in consequence. He thanked the Consultative Council and its divisional committees for the way in which they had helped the Board in its work, particularly in the field of consumer relations. He felt good consumer relations were of the utmost importance to the industry and was sure that the confidence of the consumer in the Board and the Consultative Council would continue still further to be fostered and strengthened, to give the best possible gas service that could be achieved.

New Sutcliffe Films

Two new Sutcliffe Film Unit productions were shown to a small audience in London recently. They are 'Trunk Conveyor' and 'Three Installations,' with running times of 30 minutes each.

The first shows the planning and installation of a trunk conveyor in a colliery of the National Coal Board; the other shows three typical but varied conveyor installations by Richard Sutcliffe, Ltd.

The films are available in 35 mm. and 16 mm. from Richard Sutcliffe, Ltd., Horbury, Wakefield.

Holywood Worried About Gas Price

Because of criticism of the price of gas in Holywood (Co. Down) the local Urban Council has decided to ask Bangor Borough Council for its views on the possibility of extending the Bangor main to Holywood as an alternative to the present supply from Belfast.

Mr. James L. Hyslop, Manager of the Belfast gasworks, in a letter replying to the Council's objections about the cost of gas, pointed out that expenditure was exceptionally heavy when the Holywood gasworks was taken over in 1937.

Despite that, the Belfast Corporation immediately reduced the price by 1s. per 1,000 cu.ft. The present charges were only 61% higher than in 1937, very much lower than if the supply had not been taken over by the Corporation. Mr. Hyslop also pointed out that the heating value of Belfast gas was higher than that of most undertakings in the vicinity.

The loan which had been obtained in 1937 had not yet been paid off, but in a few years the difference in cost between gas at Holywood and other areas should disappear completely. There was absolutely no question of the consumers being treated unfairly.

Co-ordination of Cathodic Protection

A Joint Committee for the Co-ordination of the Cathodic Protection of Buried Structures has been formed. Evidence of the increasing use of the method in this country is provided by the fact that, although the records are not yet complete, information has already been received on some 200 installations which are either in operation or projected. Installations by impressed current or reactive anodes are in use on water, gas, oil, and sewage pipes, telephone and electricity supply cables and structures such as oil tanks and jetties.

The need for co-ordination arises largely from the fact that current circulating in the soil due to a cathodic protection installation may accelerate the corrosion of nearby structures. Methods of assessing the probability of damage in particular cases are being studied. One method of preventing such harmful interaction is to extend the cathodic protection to neighbouring structures by connecting them to the protected structure, with suitable safeguards where necessary, either directly or through resistors or other devices. It is, therefore, necessary to consider the conditions under which such inter-connection of buried structures is permissible.

Membership of the Committee has been confined to representatives of organisations or industries responsible for buried structures through ownership or otherwise. At present the following organisations are represented: British Electricity Authority, British Transport Commission, Gas Council, General Post Office, United Kingdom Pipelines, and Water Research Association.

Since it will ultimately be necessary to make the findings of the Committee generally available in the form of a Code of Practice, a technical panel has been set up 'to study cathodic protection with a view to the eventual drafting of a Code of Practice, with special reference to the possibility of cathodically protected systems endangering adjacent buried structures, and to joint protection schemes.' Membership consists of one representative of each of the organisations listed, together with Dr. F. Wormwell, representing the Department of Scientific and Industrial Research, Chairman of the Panel.

Arrangements have been made to ensure liaison with the British Cast Iron Research Association, the British Electrical and Allied Industries Research Association, the British Iron and Steel Research Association and the British Non-Ferrous Metals Research Association.

The Secretary to the Joint Committee is Mr. J. H. Gosden, Chief Engineer's Department, B.E.A., Bankside House, Sumner Street, S.E.1.

The National Coal Board has refused to meet Midlothian Trades Council, with a view to discussing a plan to build a tar distillation plant at Dalkeith since there is no immediate likelihood of such a step being taken.

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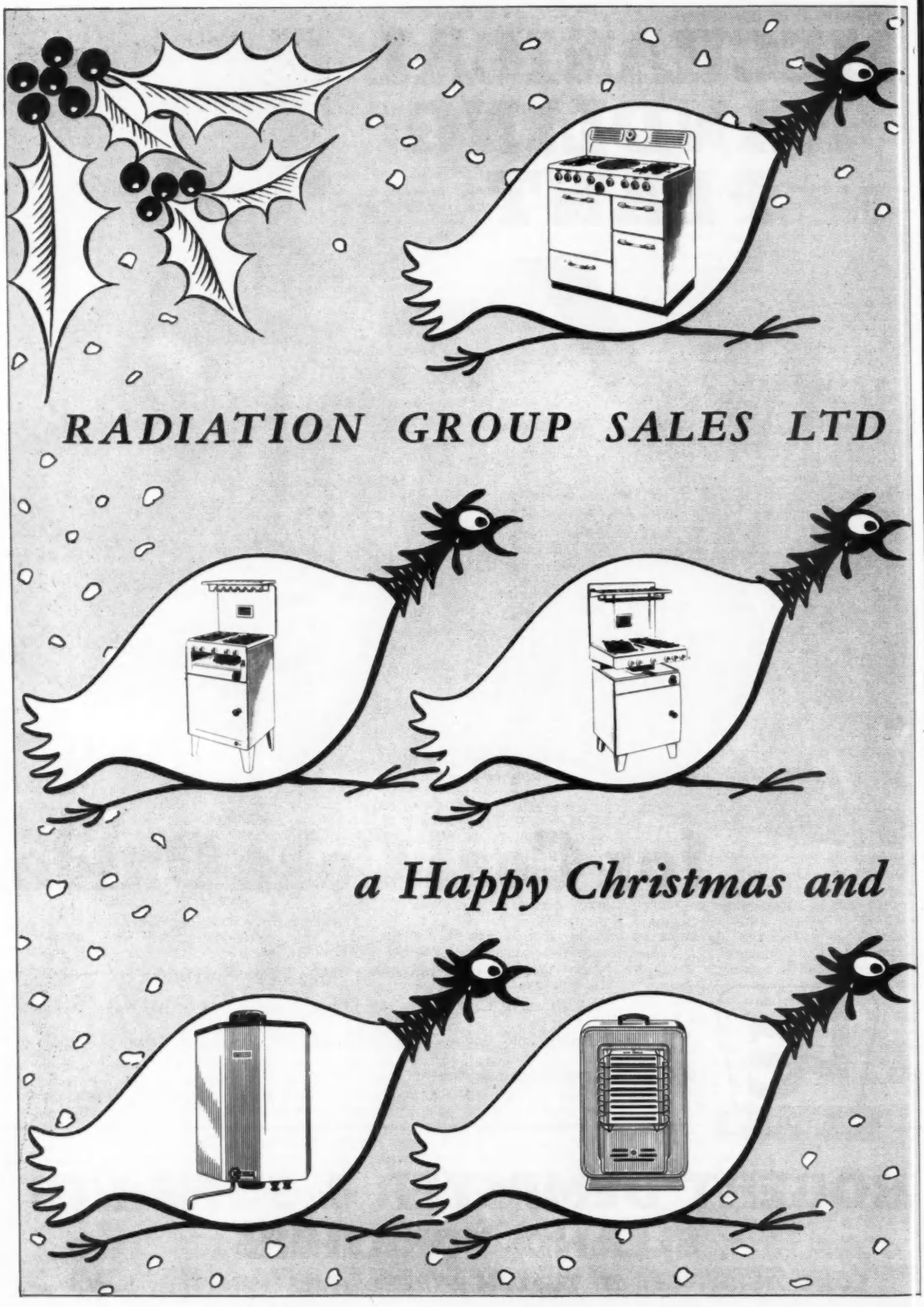
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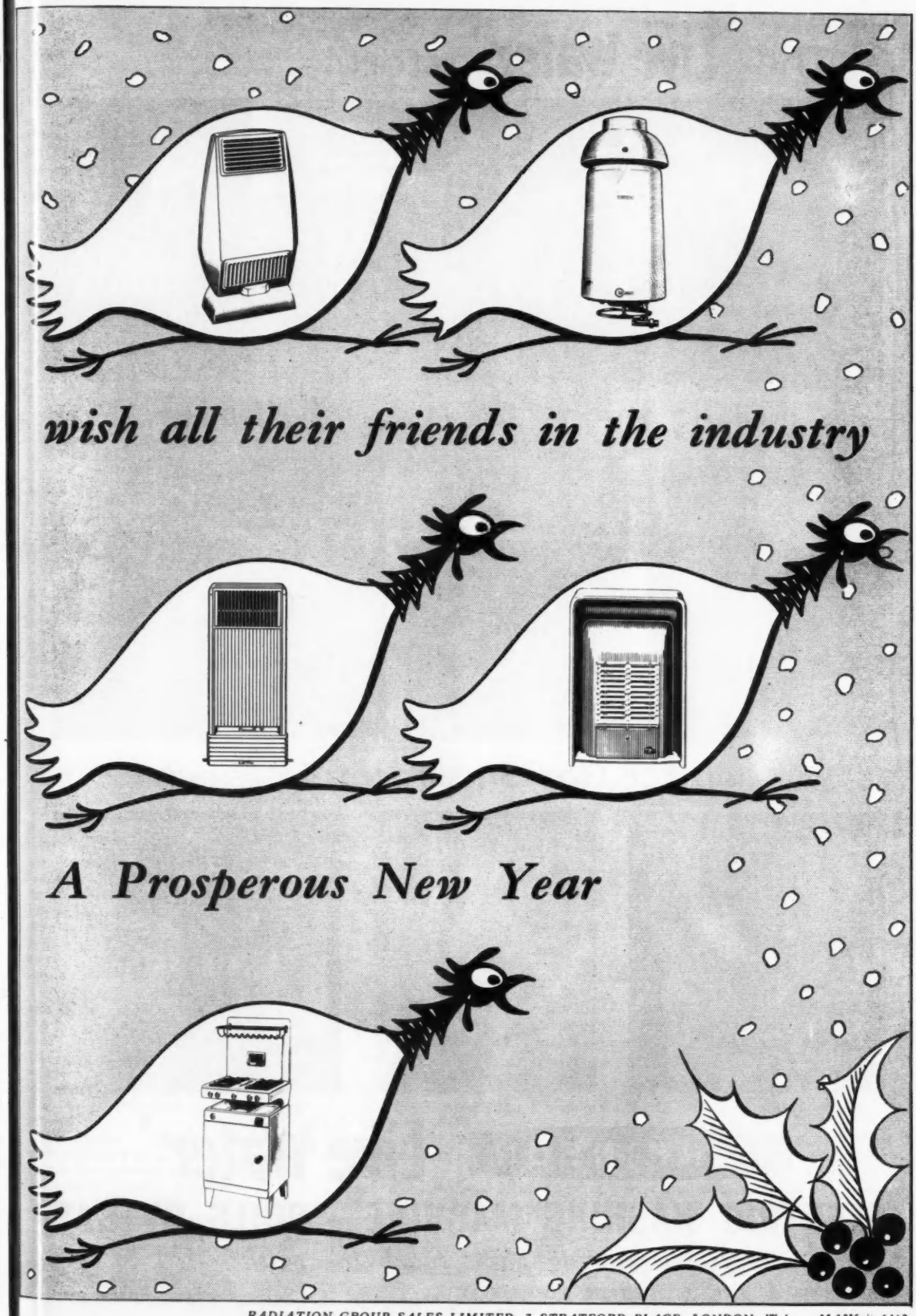
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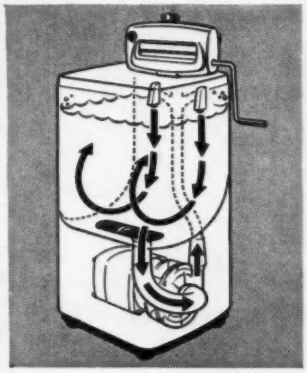
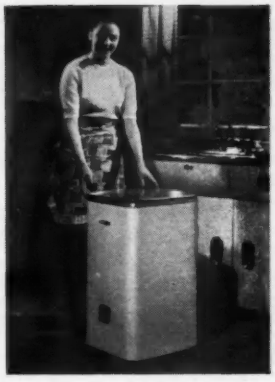

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SWANSEA'S 'BEST EVER'

Miss Nancy Gepp, of Melbourne, recently gave five demonstrations of Australian cookery dishes at the Patti Pavilion, Swansea (given to the Borough of Swansea by the world famous Adelina Patti). The demonstrations, arranged in conjunction with the Swansea undertaking of the Wales Gas Board and Radiation Ltd., proved to be most successful, a total of nearly 3,000 people attending.

Features of the demonstrations, opened by the Mayor of Swansea, were the packed audiences at every session, appreciation of the results obtained by Miss Nancy Gepp on the 3518 range, and of the samples of Australian wine handed around by the Australian Wine Board. Some 520 school children attended a special juveniles' demonstration and entertained Miss Gepp by rendering Welsh airs and 'Waltzing Matilda.' At two of the demonstrations Miss Josephine Douglas, the television panel 'expert,' was introduced to the audience by Mr. A. Pickard, General Manager and Engineer, and entertained the ladies by giving details of television and cookery experiences. Many consumers have expressed appreciation of what is considered locally as 'the best demonstrations ever of their kind seen in West Wales.'

The photograph shows Miss Nancy Gepp, of Radiation Ltd., being received by the Mayor of Swansea, Alderman T. S. Harris, J.P. Also in the picture are Mr. Albert Pickard, General Manager and Engineer, and Mr. L. Gray, Deputy Engineer and Manager.

NEW W.G.F. BRANCHES

At the first meeting of the Leeds Branch of the Women's Gas Federation, Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, said that the Board was 'completely sold on the Women's Gas Federation and was 100% behind it in regard to branch development in the area.' From the Federation, the Board learnt things of great value to it in its service to the consumer.

Dame Vera Laughton Mathews, in addressing a crowded hall on the aims and work of the Federation, said that Leeds had the distinction of being the 100th branch of the Federation. This was appropriate, as in the same area the Harrogate Branch, started in 1935, was one of the first branches to be formed.

The opening meeting of a new branch at Maidstone was so well attended that an overflow meeting had to be arranged. The meeting was attended by the Mayoress of Maidstone, and Dame Vera Laughton Mathews was the guest speaker. Mrs. E. Dixon-Grubb, the newly appointed Chairman, was in the chair.

A new branch held its opening meeting at Twickenham at the end of November. The meeting was attended by the Mayoress, and Dame Vera Laughton Mathews was the guest speaker. The Chair was taken by Miss B. Ireland, M.B.E., Chairman of the Branch. At the conclusion of the meeting 100 members were enrolled.

'Mrs. America' (Mrs. Wanda Jennings of St. Louis, Missouri) was met at London Airport and presented with a bouquet of roses from Dame Vera Laughton Mathews, Chairman of the Women's Gas Federation. 'Mrs. America' had particularly asked to visit a British housewife, and mentioned that she had tasted a Yorkshire pudding made by an English friend in America but did not know how to make it. It was, therefore, arranged that she should visit the home of Mrs. Gwen Evershed, Chairman of the West Ham and Wanstead/Woodford Branches of the Federation.

Here, in the presence of a battery of Press reporters and cameras, Mrs. Evershed showed 'Mrs. America' how to make and bake a Yorkshire pudding and they exchanged information on the running of a home; the Yorkshire pudding was cooked in Mrs. Evershed's Range model Main gas cooker.

Apprentices' 'Parents Day'

Judging by the success of the first and experimental occasion, the invitation of the Leicester and Northants Division of the East Midlands Gas Board to parents of their apprentices to come and see for themselves how their boys were trained is likely to become an annual feature. According to the current issue of *Emgas*, nearly 100 parents and apprentices turned up at the Aylestone Road canteen, where they were greeted by the Divisional General Manager, Mr. H. B. Taylor, and a number of senior officers, the boys' instructors, and other officials under whom the boys will work when trained.

The programme included addresses by Mr. Taylor and the Divisional Education and Welfare Officer, Mr. K. A. Holyoake, followed by a talk by the apprentices' chief instructor, Mr. F. P. Spencer. Afterwards, the boys were able to show their parents round the well-equipped training centre at Millstone Lane, Leicester, and many appreciative remarks were made. Refreshments and a brief film show completed the evening, and it was obvious from remarks that were made that the parents left well satisfied with what the future had in store for their sons.

Natural Gas for Budapest

Hungarian gas engineers have found and tapped a new deposit of natural gas—estimated to be at least 1,000 mill. cu. metres—to augment gas supplies for Budapest. The deposit, of pure methane of 9,000 to 9,400 calorie value, has been found in the Csomád district, 18 miles north-east of the capital. It is lying in pockets, each holding about 800,000 cu. metres.

The gas is to be drawn off into railway containers and transported to Ujpest, a Budapest suburb. From there it will be piped across the Danube to the Obuda gasworks, which has been having difficulty in supplying the city's daily requirements, in winter, of more than 800,000 cu. metres. At Obuda the methane will be mixed with coal gas in a proportion of one to three. The Obuda plant is already getting 80,000 cu. metres of natural gas a day from the Lispe oilfields.

Railway containers being used at first hold 1,000 cu. metres, but new ones, 60 ft. long and carrying 80 long steel cylinders with total capacity of 7,500 cu. metres, have been ordered. Eventually it is intended to build a pipeline from the new wells direct to the Obuda gasworks. It is planned to use these pipes for an interesting project—sending surplus gas back to the wells.

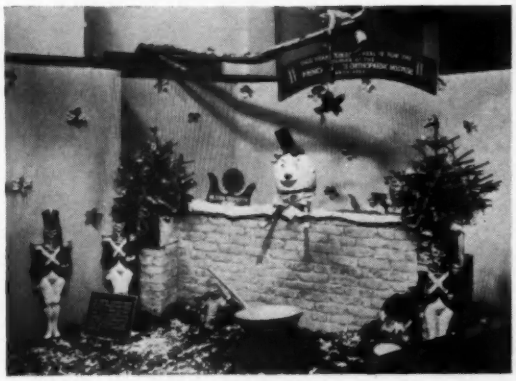
The Obuda plant is capable of producing a surplus of coal gas in the summer and the intention is to pipe this surplus into wells that have been emptied of methane, thus using them as natural reservoirs to meet heavier demands in the winter. Examination of the gas deposit is still going on. Geologists hope to find an interdependent basin, holding much more gas than the small pockets so far found.

WARM-HEARTED WELSH

For the last three Christmases the windows of the St. John Square showroom of the Cardiff undertaking have provided amusement and interest for the thousands who throng the streets of the city to finish their Christmas shopping. But the windows also carried an appeal to the warm-hearted Welsh people. They were invited to make a contribution towards the establishment of a Sunshine Home for Blind Babies which this summer was opened by Princess Margaret at Southerndown, on the shores of the Bristol Channel.

The donations received during the three Christmases amounted to more than £1,200 and in addition there is a wonderful saga of kindness and generosity to be told. Mr. James Roberts, a retired farmer, was so impressed by the window display and the pathos of the appeal that he donated a large sum of money to the Wales Gas Board for the Blind Babies' Home and subsequently gave several thousand pounds to this most worthy cause.

The Cardiff undertaking has decided to adopt a different children's hospital each Christmas from now on, and to give the money so collected each year to the adopted hospital for those little extras which are not allowed for in the official estimates but which can do so much towards making a child's stay in hospital a little more bearable.



This year the adopted hospital is the Prince of Wales Orthopaedic Hospital and our photograph shows the display—which is live—and causes much amusement. The early signs are that the generosity of the good people of Cardiff is not one whit diminished.

BRITISH TAR CONFEDERATION

The annual general meeting of the British Tar Confederation was held on November 25, when the following officers were elected for the year 1954/55: *President*, Major A. G. Saunders; *Hon. Treasurer*, L. W. Blundell; *Chairman of Executive Board*, S. Robinson; *Vice-Chairmen of Executive Board*, R. H. E. Thomas, O.B.E., and Henry F. H. Jones, M.B.E.

The Executive Board consists of ten representatives nominated by each of the Association of Tar Distillers, the British Coking Industry Association, and the Gas Council, and one representative nominated by the Low Temperature Coal Distillers' Association of Great Britain, Ltd. The following constitute the Board for the year 1954/55:—

Representing the Association of Tar Distillers:—L. W. Blundell (North Thames Gas Board); E. P. Butler (Bristol & West Tar Distillers, Ltd.); C. E. Carey (South Eastern Gas Board); J. Colligon (Dorman, Long & Co., Ltd.); E. Hardman (E. Hardman, Son & Co., Ltd.); C. Lord (Lancashire Tar Distillers, Ltd.); Wm. McFarlane (Scottish Tar Distillers, Ltd.); S. Robinson (Midland Tar Distillers, Ltd.); J. B. Vickers (Yorkshire Tar Distillers, Ltd.); W. A. Walmsley (Thomas Ness, Ltd.).

Representing the British Coking Industry Association:—Lt.-Col. P. F. Benton Jones (United Coke & Chemicals Co., Ltd.); A. Bradbury (Staveley Iron & Chemical Co., Ltd.); G. W. J. Bradley (National Coal Board, East Midlands Division); W. Robson Brown, M.P. (Richard Thomas & Baldwins, Ltd.); K. McK. Cameron (Stanton Ironworks Co., Ltd.); F. W. O. Doddrell (National Coal Board, North Eastern Division); C. F. Dutton (National Coal Board); C. M. Frith (South Yorkshire Chemical Works, Ltd.); C. F. Sullivan (National Coal Board, South Western Division); R. H. E. Thomas, O.B.E. (National Coal Board).

Representing the Gas Council:—S. Black (Northern Gas Board), D. D. Burns, O.B.E. (Scottish); E. H. Harman (East and West Midlands); W. Hodkinson, O.B.E. (North Western); W. K. Hutchison, C.B.E. (South Eastern); Henry F. H. Jones, M.B.E. (Gas Council); A. McDonald (North Eastern); M. Milne-Watson, C.B.E. (Eastern and North Thames); J. Powdrill, M.B.E. (Wales); S. E. Whitehead, O.B.E., J.P. (South Western and Southern).

Representing the Low Temperature Coal Distillers' Association:—Commander Colin Buist, M.V.O., R.N. (retd.).

The Fishburn Carbonization Plant built for the National Coal Board has been described in a fine example of good technical journalism published by the Woodall-Duckham Construction Co., Ltd., the main contractors. Colour-printed, the brochure guides you on a well-illustrated tour of the plant.

Scottish Trade Fair

Over 90% of the exhibitors at the 1954 Scottish Industries Exhibition at the Kelvin Hall, Glasgow, reported in a survey of results that they considered the venture worthwhile, and business done at the exhibition was in excess of £10 mill. These figures were given by Mr. R. A. Maclean, Chairman of the exhibition, at a meeting of the General Committee on December 6, when he mentioned also that some 40,000 trade buyers had attended during the 15 business days. The popularity of the exhibition with trade buyers could most easily be seen from the daily attendance records. On the opening day some 900 buyers attended. This was followed on successive days by 1,800, 3,300 and 2,500, and attendances averaged nearly 4,000 a day on the last three business days of the show. Total public and buyer attendance was nearly 400,000.

The exhibition, which is backed by a guarantee fund and draws no subsidy whatever, is expected to show a surplus of approximately £11,000. It has not yet been decided when the next Scottish Industries Exhibition will be held but it is likely that an interval of a few years will be allowed to lapse before the next show is promoted.

Week-end School for Gas Staffs

The East Midland District of the National and Local Government Officers' Association is arranging a week-end school for gas staffs at The Hayes, Swanwick, on February 26 and 27. The first day's programme comprises an official opening by Mr. L. Taylor, President of Nalgo, a lecture on 'Human Relations in the Gas Industry,' by Mr. F. L. Ffoulkes, Industrial Relations Officer of the East Midlands Gas Board, and a lecture on 'Economics of the East Midlands Board,' by Mr. E. H. Harman, Deputy Chairman of the Board.

On the Sunday, Mr. J. H. Dyde, Deputy Chairman of the Eastern Gas Board, will speak on 'The Past, Present, and Future of the Gas Industry,' and the afternoon will be devoted to an open forum, with Mr. Sydney Smith, Chairman of the East Midlands Board, as question master. Each lecture will be followed by an open discussion.

Accommodation is limited and application for enrolment should be made through Nalgo officials not later than January 14. The charge will not exceed £1 per member, plus travelling expenses; this charge includes meals, social entertainment, and sleeping accommodation.

Christmas Holidays.—Our printers will be closed for four days over Christmas, and we would advise our readers and advertisers that, in consequence, the 'GAS JOURNAL' and 'GAS SERVICE' Offices will close on Friday evening, December 24, and re-open on the morning of Wednesday, December 29.

MANUAL OF GAS FITTING

by R. N. Le Fevre

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PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/3d.; by post 1/5d.

Subscription Rates: Home and Empire:—52/- per annum; Foreign:—60/- per annum. (Both payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words)—minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10 in. deep × 7 in. wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

MIDLANDS MANAGER: G. B. Torrance, 42, Wychall Lane, King's Norton, Birmingham, 30. *Telephone:* Kings Norton 3868

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

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Christmas Holidays

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18–64 inclusive or a woman aged 18–59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

APPLICATIONS are invited by the Gas Council for the appointment of ASSISTANT STATISTICIAN. Candidates should hold an Honours Degree in Statistics or in Mathematics, Economics or other appropriate main subject with Statistics, and should have experience in the statistical work of a commercial, industrial or public corporation. Commencing salary in the scale £745–£845 a year. The post is pensionable and the successful candidate will be required to pass a medical examination.

Applications giving full particulars of the candidate's qualifications and experience and the date on which he would be able to take up his appointment should be sent not later than January 15, 1955, to The Secretary, The Gas Council, 1, Grosvenor Place, London, S.W.1.

SCOTTISH GAS BOARD

Glasgow Division
Glasgow District
Technical Assistant (Chemical)

APPLICATIONS are invited from suitably qualified persons for the position of TECHNICAL ASSISTANT (CHEMICAL) at the Provan Works of the Glasgow District.

Candidates should have had considerable experience in the operation and control of Continuous Vertical Retorts, Automatic Carburetted Water Gas Plants and all ancillary processes.

The salary will be within the Grade A.P.T. IX (Provincial 'A') £655–£755 per annum and the successful applicant may require to undergo a medical examination and join the Board's Pension Scheme.

Applications endorsed T.A./C. giving particulars of age, training, qualifications and experience should be received by the undersigned within fourteen days of the publication of this advertisement.

D. F. YOUNG
Divisional Controller

30 John Street
Glasgow C.1.

WALES GAS BOARD

PEMBROKESHIRE GROUP
HOME SERVICE ADVISER

APPLICATIONS are invited from suitably qualified ladies for the above appointment.

Applicants should possess a recognised qualification in Domestic Science and be fully conversant with the organisation of cookery and other demonstrations.

The successful applicant will be required to work within the Pembrokeshire and Carmarthen Groups and will be based at Pembroke Dock.

The salary will be within Grade A.P.T. 4, Provincial 'B', £256 to £408, commencing salary to be fixed in accordance with experience and qualification but will not be less than £308 per annum.

The person appointed will be required to pass a medical examination and to contribute to the Board's Staff Pension Scheme.

Applications stating age, qualifications, experience and names and addresses of two persons to whom reference can be made, should be received by the undersigned not later than December 31, 1954.

G. A. WILLIAMS,
Convener,
Pembrokeshire Group.

44, Bush Street,
Pembroke Dock.

SOUTH EASTERN GAS BOARD

SENIOR INSTRUCTOR
CENTRAL TRAINING ESTABLISHMENT
4/6 WANDSWORTH ROAD, VAUXHALL

APPLICANTS should have experience in lecturing and demonstrating in the utilisation of gas and will be required :—

(*a*) to give technical instruction in the utilisation of gas and the installation work connected therewith to the staff of the Commercial Department, including new employees, trainee district representatives and showroom assistants ;

(*b*) to correlate and generally supervise the instruction in Divisional Training Centres which will include the theory and practice of gas fitting and technical refresher courses for qualified gas fitters, district representatives and showroom staff.

Salary within Grade 11 (Met. Area) £770–£895 per annum.

Applications in writing, quoting reference V10/486 and giving details of qualifications and experience should reach the undersigned not later than fourteen days after the publication of this notice.

R. J. MCCRAE,
Personnel Manager.

Katharine Street,
Croydon.

SOUTH EASTERN GAS BOARD

SENIOR ASSISTANT CHEMIST,
TAR WORKS, ORDNANCE WHARF,
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A VACANCY EXISTS for a qualified CHEMIST to develop methods of organic analysis, to investigate problems arising in tar distillation, and to carry out general analytical work of a non-routine nature. An interest in industrial chemistry is desirable.

Salary not less than £655 per annum.

Applications in writing quoting reference V10/487 and giving full details should reach the undersigned within fourteen days.

R. J. MCCRAE,
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Katharine Street,
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ENGINEER, experienced in modern methods of Thermal Efficiency Testing of Hot Water Heating and Domestic Boilers and Stoves required by large industrial firm in East Anglia. Contributory Pension Scheme and free Life Assurance Scheme in operation. Applications stating age, education, experience and salary required should be addressed to : No. 219, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

EASTERN GAS BOARD

IPSWICH DIVISION
CHELMSFORD DISTRICT

TWO FIRST CLASS GAS FITTERS urgently required to work in the Chelmsford District of the Board. Full J.I.C. Rates (Provincial 'A') and Conditions of Employment. The successful candidates may be required to pass a medical examination. Applications giving details of age, experience and two references, should be addressed to Mr. F. N. Howes, Group Manager, Chelmsford Group, Eastern Gas Board, Gas Works, Chelmsford, within fourteen days of the appearance of this advertisement.

EAST MIDLANDS GAS BOARD

NOTTS & DERBY DIVISION
HOME SERVICE ADVISERS—
MANSFIELD/SUTTON DISTRICT
LONG EATON/ILKESTON DISTRICT

APPLICATIONS are invited for the positions of HOME SERVICE ADVISERS in the above Districts. Salary range £308/464 per annum, the commencing salary to be commensurate with the capabilities of the successful candidates.

Candidates must be capable of working independently and be in possession of a recognised Diploma in Cookery and/or Domestic Science. They should be proficient in the practical demonstration of gas cooking, laundering and other appliances, and be able to advise consumers on all domestic problems involving the use of gas in the home.

The positions are pensionable and the successful applicants will be required to pass a medical examination.

Applications stating age, experience and present position, and giving full particulars of training and qualifications, together with the names of two referees, should reach the undersigned not later than Saturday, January 8, 1955.

K. L. PEARCE,
Divisional General Manager.

East Midlands Gas Board,
Notts & Derby Division,
Friar Gate,
Derby.

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Capacity Range: *45-280 cu. ft. of gas per hour.*

Note.—These four burner heads are for high pressure gas or low pressure gas and air blast.

Brass non-blow-off head types: *deal with 5 to 10 cu. ft. of gas per hour.*

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Perforated head type burner: *deals with 10 or 15 cu. ft. of gas per hour.*

Type 2 Mixture Controller, *for controlling quality of air gas mixture irrespective of varying pressures and resistances. Temperature control is varied by manipulation of the air cock only.*
Capacity Range: *from 130 to 1380 cu. ft. of gas per hour according to air pressure (¼ lb. to 1lb.) and size. For low pressure gas systems.*
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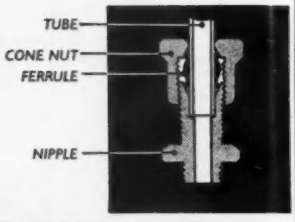

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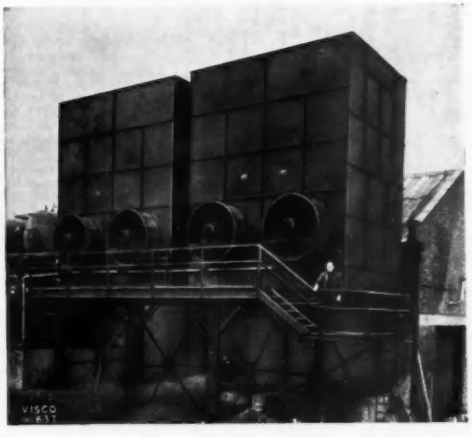

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We have all sizes. *Ask for List No.* 514

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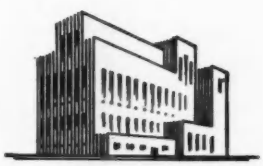

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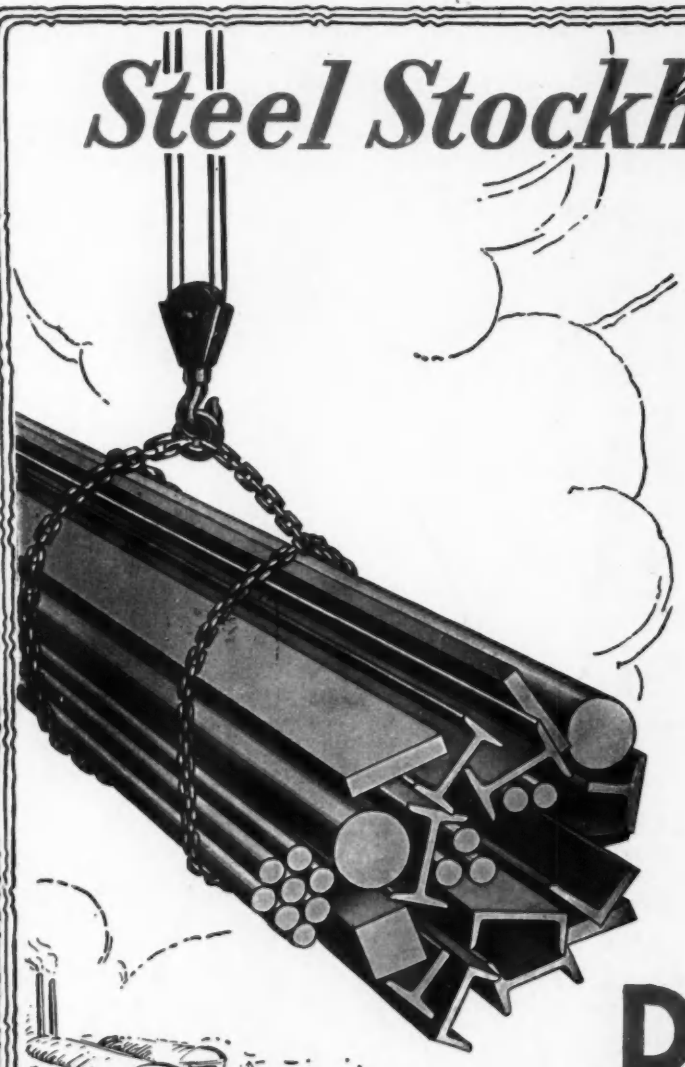

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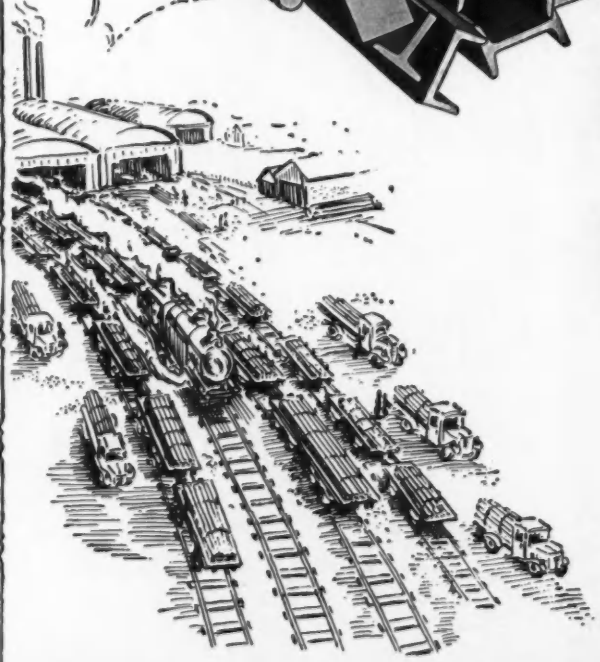

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